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# CHILD DEVELOPMENT





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# Predicting Puberty<sup>1</sup>

CHARLES D. FLORY

GROWING children reach a point in their development when childhood is replaced by reproductive ability. Popular usage considers adolescence as a developmental stage synonymous with the "teen-age." A reference to experimental literature reveals that an arbitrary period of seven "teen-ages" (13 to 19 years inclusive) does not cover the last stage of growth in all individuals. Some children reach puberty and experience the accompanying physiological changes long before age thirteen; other individuals are still pre-pubescent in the late teens and continue to experience significant growth increments beyond their twentieth birthdays. The range of ages at which puberty occurs is approximately from nine to eighteen inclusive for children who are normal mentally. Feeble-minded individuals have a very checkered picture in all of their development but on the average are quite late in becoming pubescent. Since the normal age range for puberty is approximately ten years it seems important to give some consideration to means whereby the probable onset of pubertal changes in a given child

can be predicted. It is the purpose of this paper to consider certain anthropometric measurements and osseous indices which will predict the age at which a given girl is likely to reach puberty.

Mankind has for centuries past attached considerable significance to the transition from childhood to a more mature stage of development. Primitive peoples built up elaborate ceremonies through which maturing youths were introduced to full social status. It is not quite clear to objective-minded investigators whether adolescence is really a time of "storm and stress" as some writers would have us believe or whether the mystery which has surrounded procreative ability has produced ceremonial celebrations which further complicate the interpretation of the developmental phenomena. Church confirmation, school organization, and social practice have been significantly influenced by supposed transformations which are thought to accompany puberty.

The general attitude of the layman toward adolescence is well illustrated by the girl who wrote in her diary:

I'm 20 years old this day, and I hate it. Out of my 'teens. 'Teens is such a peach of a word. It makes you think of ten hoodlums in one car going somewhere, telephone calls an hour long, and jazz, and fraternity pins, and kissing people without cause or

<sup>1</sup> This study has resulted from a Research Fellowship in Child Development at the University of Chicago. The fellowship has been provided by the General Education Board.

effect, and being insane over football games because your sweetie's playing fullback. Of course, all that lasts over into the 20's a little way, but it's a sort of a hangover then, it seems to me. I know I'll never feel the same again.

As the mystery of sex has been gradually removed by a study of biology some of the so-called "storm and stress" has been eliminated from adolescence. Pubertal changes though still uncharted are nevertheless sufficiently significant to warrant consideration by research workers and practical school people. If techniques can be developed for predicting the probable year in which puberty will occur then those investigations which purport to describe the changes at adolescence can be confined to a much more definite age range in the life of a given child.

#### THE SUBJECTS

The cumulative records system of the University of Chicago Laboratory Schools has been in operation for a sufficient time to provide data for a number of subjects over a ten-year period. Eighty girls, who had quite complete records, were selected as subjects for this investigation. Anthropometric measurements had been made on each subject on or very near her birthday. All of the subjects considered had an X-ray of the right hand at yearly intervals. A complete physical examination made annually near the child's birthday provided an opportunity to obtain data concerning pubertal development. It was possible from these records to construct a relatively complete picture of the child's physical development.

Girls were selected as subjects for this study for two reasons. First, the date of first menstruation used as a criterion of puberty among girls has no comparable counterpart among boys. Second, the number of girls with consecutive records exceeds by far the number of boys with equally complete records.

Each subject had entered the University of Chicago Laboratory Schools several years before the onset of pubescence. Data were therefore available before, at the time of, and after the occurrence of puberty. At some ages and for two of the predictors considered later in this paper fewer than fifty of the eighty subjects had complete records. It will be possible in future years, as evidence continues to accumulate, to use a larger body of data and thereby obtain more stable correlations for the several predictors to be considered.

#### Predictors

*Anthropometric measurements.* Anthropometry has long found favor in child development centers. Techniques have been refined so that measurements can be made with high reliability. How well do these physical measurements predict the onset of pubescence? Height and weight will be omitted from this discussion since many other investigators have dealt with these two measures.

It may seem improbable that head size would have any relation to puberty but several correlations were computed to support or disprove the general opinion. Since head size has nearly completed its growth before puberty occurs it was felt that age nine should

be used to compare the relationship between head dimensions and puberty. Head length at age nine correlated  $.10 \pm .11$  with first menstruation, while head width correlated  $.20 \pm .11$  with the same criterion.<sup>2</sup> It is of some significance that both of these correlations go in the same direction but one would certainly not continue to measure heads merely for the sake of predicting puberty.

Changes in chest dimensions with the onset of pubescence would lead one to suspect that there is a relationship between chest measurements and puberty. If a measure is to be used for predictive purposes it needs to be taken before the occurrence of the event to be predicted. Chest measurements at age twelve, approximately one year before the average age for first menstruation, show the following correlations:  $.26 \pm .08$ ,  $.34 \pm .08$ , and  $.46 \pm .07$  for girth, depth, and width respectively with the criterion for puberty. Lung capacity at age twelve which is somewhat related to chest size correlates  $.32 \pm .08$  with first menstruation. All measurements of chest dimensions are related<sup>3</sup> to puberty but it is clear that chest width has the best predictive value, if the age at which puberty will occur is the desired prediction. Lung capac-

ity is about equal to chest depth as a predictor of puberty. It is possible that chest width can be determined more accurately than other chest measurements but it is interesting to note that head width was more closely related to puberty than head length. It is not quite clear why widths should be better predictors than volume, lengths, heights, or girths. Neither head nor chest dimensions are highly valuable as predictors of puberty though chest measurements have a closer relationship to first menstruation than head size.

Hip measurements have been thought to be closely associated with puberty. That pre-pubescent girls differ from post-pubescent girls in hip dimensions can not be denied but a mere increase in size with age does not necessarily mean a good predictor of puberty. Iliac and trochanter widths at age twelve correlate  $.57 \pm .06$  and  $.58 \pm .06$  respectively with first menstruation.<sup>4</sup> Iliac width is considered the more accurate hip measure but it is no better predictor of puberty than trochanter width. At age nine iliac and trochanter width correlate  $.41 \pm .10$  and  $.37 \pm .10$  respectively with puberty. It is significant to note that hip measurements at age nine will predict puberty nearly as well as the best chest measurement at age twelve. While chest dimensions are better predictors of puberty than head measurements, hip widths are superior to the best chest measurement as a predictor of first menstruation.

<sup>2</sup> These correlations will be positive or negative depending upon the arrangement of the scale. Head size and age at which first menstruation occurs are really negatively associated, i.e. the larger headed children reach puberty at the earliest age. These coefficients have been made positive by inverting the scale on one axis of the correlation sheet.

<sup>3</sup> Previous note on the sign of the coefficient applies.

<sup>4</sup> Again the coefficients have been made positive by arranging the scale. Large hip size goes with early puberty.

Although correlations of the magnitude found from anthropometric measurements can not be disregarded as predictors of puberty, one would not be content to make predictions from measurements which are a mere 15 or 20 per cent improvement over chance. Any correlation below .60 has a predictability which is less than 20 per cent better than a guess: Anthropometric measurements taken singly do not seem to fill the need as predictors of puberty.

A combination of several dimensions was even less suggestive than the straight correlations reported above. A sum of three head dimensions, height, length, and width, correlated  $.22 \pm .11$  with first menstruation. Head width is practically as good as a combination of these three head measurements. Iliac width divided by trochanter width correlated only  $.22 \pm .10$  with puberty, which is much lower than either measure taken singly. The sum of chest width, iliac and trochanter widths correlated  $.46 \pm .08$  with first menstruation but chest width alone is as good as the three taken together. Iliac width plus chest width correlated  $.48 \pm .08$  with puberty but this combination is less desirable than iliac width alone. Some combination of or ratio between anthropometric measurements may eventually be found which will predict puberty better than single measurements, but the present investigation turns to other predictors of first menstruation.

*Osseous development.* Early investigators who made use of X-ray techniques to determine the degree of skeletal development had hopes

that anatomical age might eventually replace chronological age as an index of the stage of maturity. Relationships between ossification and intelligence, ossification and school progress, and ossification and anthropometric measurements have been widely studied. Some attempts have been made to relate skeletal development to the physiological development signified by puberty. But very little detailed work has been done in this latter field of investigation.

The ossification ratio as devised by Carter (1) is one of the well known measures of skeletal development. Ossification ratios at age eleven correlate  $.30 \pm .07$  with first menstruation.<sup>5</sup> Although this coefficient is low it suggests a possible relationship between osseous processes and puberty. The writer has in preparation a scale whereby the osseous development of a given child can be determined in skeletal months values. Thus an eleven-year-old child who is retarded one year would have a rating of 120 skeletal months, whereas a child of the same age who is accelerated one year would have a rating of 144 skeletal months. Skeletal months ratings which were made for a group of eleven-year-old girls correlate  $.64 \pm .05$  with first menstruation. This value is the highest relationship thus far reported between osseous development and puberty when age is held constant.

Some writers have contended that bone appearance is of little value in determining the degree of osseous

<sup>5</sup> These coefficients have been made positive by arranging the scale as was done with anthropometric measurements.

development. The age at which the pisiforme appears correlated  $.53 \pm .07$  with first menstruation. This bone, the last of the carpals to appear, has a definite relationship with puberty. The writer observed that girls who reached puberty early had sesamoid bones at an early age. It was found that the sesamoid at the distal end of the first metacarpal, which is present in all mature individuals, is always present before a girl menstruates. There is therefore some relationship between the appearance of this sesamoid and puberty. The degree of relationship was found to be expressed by a correlation coefficient of  $.76 \pm .04$ . This one point on the X-ray of the hand which can be determined quite objectively and with little or no training in roentgenology has a higher predictive value than either anthropometric measurements or skeletal evaluations. The sesamoid at the distal end of the first metacarpal appears on the average at age eleven or about two years prior to puberty.

It may appear on the face of these data that the appearance of the sesamoid is a better predictor than other measures of osseous development. Skeletal months ratings at eleven years of age correlated  $.64 \pm .05$  with puberty when age was held constant, while sesamoid appearance usually has a wide age range. No prediction can be made from the absence of the sesamoid except that puberty has not yet been reached and is not likely to be reached within the following year. The age range for the appearance of the sesamoid is approximately nine to thirteen years of age or a five year period. Skeletal months ratings

which hold age constant and give an evaluation at any age have advantages over a single point such as the appearance of a sesamoid. The simplicity and objectivity with which sesamoid appearance can be determined add to the value of this predictor of puberty.

Further investigation shows that no girl has reached puberty whose ossification ratio is below 1.00. Though ossification ratios correlate low with first menstruation this critical point, when the area of the bone shadows exceeds the area of the carpal quadrilateral as defined by Carter, seems to be of some value. No girl has a ratio below 1.00 if the sesamoid on the distal end of the first metacarpal is present. On the other hand, if a girl whose X-ray reveals the presence of the sesamoid has not reached puberty one can be relatively certain that the first menstruation will occur within the next twenty-four months. These facts from osseous development suggest that there is a closer relationship between osseous development and pubertal development than there is between anthropometric development and the date of the first menstruation.

#### CONCLUSIONS

Cumulative data reveal that puberty is an event which is related to physical size and osseous development. While any physical dimension seems to have some relationship to the onset of pubescence, it is quite clear that head measurements are less valuable than chest measurements and hip widths are more valuable than chest dimensions as predictors of first menstruation. Osseous development seems to be more closely related to puberty

than is physical size. Skeletal months ratings are better predictors of first menstruation than any anthropometric measurement considered in this study. The time of the appearance of the sesamoid on the distal end of the first metacarpal is the simplest and best single predictor of puberty in girls. No girl has menstruated whose ossifi-

cation ratio is below 1.00 or whose X-ray of the hand shows the absence of the sesamoid at the distal end of the first metacarpal. Sesamoid appearance usually precedes puberty by about two years. A further accumulation of data may give more definite support to these tentative conclusions.

#### REFERENCE

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# The Problem of Child Development<sup>1</sup>

L. K. FRANK

**T**HIS paper is an attempt to state the problem of *child development* as a focus for scientific research and to set forth somewhat briefly the methods which initially may be employed in its study. Finally, an effort will be made to indicate the significance of this problem and its relation to various scientific enterprises in the field of medicine, psychiatry, and hygiene.

## I

In general, child research is primarily directed by the current problems and preoccupations of the several branches of life science which utilize the child as a convenient and significant subject for investigation and experiment on those professional problems. It must be evident, however, that the human child, as a *developing organism with a prolonged infancy*, may be approached as a subject of scientific inquiry giving rise to problems which are in many ways peculiar to themselves, calling for a formulation and

methods of study distinguishable from the various enterprises in child research just described. It is from this direction that the problem of child development arises and merits our attention. The emergence of this problem of child development is itself not without significance for our discussion, since it may be said to express the far-reaching shift in scientific conceptions which is now under way. Perhaps the simplest way of indicating this shift is to refer to the increasing interest in and discussion of what has been called the "organic" or "organismal conception" or the "organism as a whole." The consideration of these topics and the attempts to formulate these conceptions with increasing precision are, in the writer's opinion, no unique creations without antecedent preparation. Rather it would seem that the very success with which the various branches of the life sciences have pursued their inquiries has made this development inevitable. For a generation or two scientific workers in the different fields of work have been preoccupied with the laborious task of perfecting methods for the collection, recording, and measurement of the different kinds of data which a growing organism may yield. Such studies must by their very nature be restricted in their scope and confined to the discovery of the relation between

<sup>1</sup> Presented to the First Biennial Meeting of the Society for Research in Child Development, Washington, D. C., November 3 and 4, 1934. An earlier statement of the point of view and formulation of this paper was given at the Washington Conference on Child Development, May 1927 (see Proceedings of Conference, Committee on Child Development, National Research Council).

data and the structure or activity from which those data proceed. It is, therefore, permissible to view the rise of this interest in the total organism as a more or less inevitable development of these preceding studies, because we have arrived at a point where these basic and fundamental inquiries have yielded results of astonishing character in the shape of reliable methods and verified data for the study of structures and functions of organisms. Thus, having achieved many of the threshold tasks of biological science, investigators of a more inquiring mind have begun to ask themselves what significance inheres among these verified data and how far has the very abstraction characteristic of this preparatory work served as a barrier to the understanding of those processes which are carried on within the organism as an integrated and interdependent whole.

Concurrently with these questionings and speculations, there have been repeated cases in which investigators, intent upon the study of a discrete problem, have found, to their amazement and chagrin, that their carefully elicited data were either incomprehensible or unusable because the organisms from which those data had been obtained were, apart from the two variables measured, unknown and ununderstandable.

## II

We may say that growth and development are the changes in magnitude and configurations occurring during the life career of an organism as exhibited in its developing structures and functions as well as in its

total overt activity as it moves toward maturity. These changing magnitudes may take place either through constant increments or decrements, giving a smooth line, or through cycles of increments followed by decrements wherein the successive advances overbalance the successive recessions, or vice versa, in the sequence of oscillations. Development as herein used implies decrease or involution in structure and function as well as increase.

The human infant at birth is viable but not complete in structure and function nor physiologically organized, and so must grow to completeness and achieve maturity both structurally and functionally during its prolonged infancy, as the following quotation from Walzen (5) indicates:

"The baby at birth is physiologically incomplete and this manifests itself in all parts of the body through instability or irregularity or lack of function. How this incompleteness passes over into the steady functioning of the normal adult, or perhaps fails to do so in the abnormal adult, is a field of investigation largely untouched and yet one which has a vital bearing on the proper understanding of the young child."

Since there cannot be a function without a structure nor a structure without a function, development implies concomitant changes in structures and functions. The fluctuations or oscillations in magnitude, *e.g.*, in intensity or duration or extension, which take place during growth may be regarded as essential in the growth process, since any fixity of function or process or of structure would interfere with, if it did not frustrate, growth changes. Growth and stability are not compatible, since organs must



continue to function while growing. For example, growth of the stomach occurs through changes in the upper and lower limits of expansion and contraction as it functions daily; the range of distension is gradually enlarged through these oscillations in the functioning organ.

Growth or development may, therefore, be regarded as the secular trend arising from or generated by these oscillations or cyclical fluctuations of structure and function. To the extent that these oscillations or cycles, when plotted, present their concave sides in opposition, we may, as suggested by Dr. Ragnar Frisch, conceive of an individual norm around which the fluctuations take place, this norm being the line of secular trend or organic growth for that fluctuating structure or function.

If the conception of an organism or of organic unity be valid, then it is probable that these oscillations and fluctuations in the structure and functions or processes of the growing child are interrelated. To put it another way, the magnitude of change of structure or function in the growing organism at any moment is related to the magnitude of all other structure and functions in that organism with greater or less immediacy, from which it follows that any perturbation within the organism will be transmitted with greater or less effect and *with varying lags* through the whole of the organism. This latter point is expressed in the general conception of compensation or internal adjustment as illustrated by the work of L. J. Henderson and of D. D. Van Slyke on the respira-

tory cycle and of W. B. Cannon on homeostasis.

### III

Each of the changing structures and functions of the growing organism yields, or may be made to yield, data which reveal directly or indirectly what is taking place therein. Consequently, the growth and development of a child may be studied through the application of all relevant scientific techniques to the individual child and the collection thereby of the various data indicating these changes in the structures and functions of that child.

The foregoing leads us directly to the problem of child development which we may state as the problem of discovering the rate and direction of change in the structures and functions of the child and of revealing the interrelationships existing among the several structures, functions, processes, and activities as disclosed by their appropriate data. These several classes of data may be distinguished as falling into two classes: (1) structural characteristics which are revealed in the changing magnitudes of the total organism and of its various systems and parts, recorded and measured primarily in physical terms, *e.g.*, mass and extension; (2) functional activities divided into, (a) endogenous or internal processes, and (b) overt activities, which are revealed in the changing spatial configurations and energy transformations that constitute the function or activity. Recalling that the human infant is at birth incomplete in structure and function

and not yet integrated, we may see that the maturity of the human organism involves the attainment to a more or less "steady state," as contrasted with the instability found in the infant and the child. This task of achieving maturity, both structurally and functionally, states the problem of child development and indicates the technique for its study. Essentially, the task is to record and measure as many as possible of the changes taking place in the growing child and to ascertain what, if any, sequences are discoverable among the changing magnitudes of the several structures and functions. Having recorded and measured these changes, it then is appropriate to inquire whether the magnitude of the fluctuations shows any change over a period, *i.e.*, whether as the child grows older the magnitude of the fluctuations decreases (or increases) as the child approaches the "steady state" of maturity. Again, it is necessary to calculate the line of secular trend for each of these fluctuating structures and functions in order to discover the rate and direction of change of that structure or function so that its movement toward maturity may be studied both as a process having presumably, a law of its own, and as a member in a series of concomitant changes, the rates of which will be related one to the others. Finally, it is important to discover from these different series of data from each individual child what is the order of development among these changing structures and functions and activities, thereby revealing the accelerations and retardations, the precocities and infantilisms within the growing child.

This order or sequence of development offers the clue to the understanding of the individualized child who is engaged in working out a method of living, growing, learning, and otherwise functioning within the limitations of these different maturities. It is precisely this highly individualized organic condition of varying rates of development which gives rise to the unique, idiosyncratic individual with his peculiar personality, idiomatic functioning and differentiated structures.

If we reflect upon the methodological principles and techniques involved in the foregoing, we will see that they call for, first, the application of the various scientific techniques and measures to the individual growing child and the discovery of the significant intervals for which successive determinations of each structural and functional change must be made. That is to say, for each of the structures and functions of the growing child as revealed by known or to-be-discovered techniques of measurement, we must determine how frequently measurements must be taken in order to reveal the rhythm of fluctuation either as a recurrent process of a short period or as a process with a long-term period of frequency. Having determined then how frequently these measures must be made, the data thus obtained must be analyzed and plotted for each individual child separately in order to reveal the fluctuations in the structures and processes of the individual thus measured. Herein the techniques developed for the analysis of time series, especially as they have been worked out for economic data in the study of business cycles, may

be found highly valuable and appropriate, since the manipulation of these data calls for the measurement of the magnitude of the fluctuations in each set of data and for the calculation of the line of secular trend which those fluctuations generate. To illustrate by a concrete example, if a daily record is taken of the number of hours an infant is awake in each twenty-four hour period, we would have a series of records showing the fluctuations from day to day in the total number of hours awake, with a gradual increase in the number of waking hours as the child grows older. The manipulation of the raw data through known techniques would show how far the magnitude of the fluctuations was changing from day to day, and would also give the line of secular trend indicating the child's gradual relinquishment of sleep and assumption of wakefulness during the day, through daily variations that have a trend downward.

Therefore, in so far as the data on the various structures and functions of the child were calculated and plotted, we would have available for that child a series of curves showing the cyclical fluctuations and the gradual changes in the upper and lower limits of those fluctuations over a period, together with the lines indicating the resultant changes and magnitudes of structure and function arising out of these fluctuations. It is submitted that the changes in the magnitude of these fluctuations is indicative of the organism's approach to the "steady state" of maturity and that the line of secular trend traces the organism's achievement of those magnitudes,

structures, and functions which are characteristic of the adult state and to some extent before puberty.

It is to be noted, however, that our assumption that these functions are interrelated because they are exhibited by the unified organism makes it impossible to consider any one of these curves as an isolated event; rather we are forced to consider the development of the child as taking place through a number of interdependent events, *no one of which can be segregated, except for purposes of measurement*, and no one of which can be understood or interpreted without taking into account the concomitant events of the total organism. From this it follows that any undue perturbation in the magnitude of these fluctuations or any shift in the line of secular trend which they reveal is to be regarded as an indication of a total organic change of which we may expect to find indications of greater or less degree of sensitivity in all the other data collected from that organism, *but with varying degrees of lag*. Here we must be on our guard against assuming that either the fluctuations or the growth curves of structures and functions will be correlated since it is unlikely that, in an incompletely organized individual such as a growing child, anything will be correlated for long.

It will be seen from the foregoing that we may at once address ourselves, through such analyses of the various data, to the study of what is taking place in the growth process of the total organism and thereby obtain possible clues to the puzzling features of the present study of the isolated structures and functions in the child.

Significant both for scientific research and for child welfare, the study of the magnitude of the fluctuations in the various structures and functions of the child might lead to the discovery of the range or amplitude of fluctuations that is compatible with wholesome growth and development. Moreover, the study of the changes in the amplitude of these fluctuations, and of the various growth curves they generate, during the period of growth to maturity would indicate whether any particular structure or function was failing to mature concomitantly with the others, and would thereby show that the various kinds of defects discoverable in children are essentially symptoms or evidences of the failure of the growing child to maintain a coördinated rate of change in all of the various growth processes involved in the maturation of the organism. From this we might infer that any lag or retardation in the growth of structure or process would of necessity become cumulative with advancing years and it is evident from the available clinical material that we do have all manner of retardations and precocities in children. By assuming that normal development implies not absolute coördination in the changing structures and functions but rather a sequence based upon the relative rates of change appropriate to each structure and function, we may approach the problem of normal development not as the establishment of statistical norms for chronological age or fixed dimensions that all children should attain at any year or incident of time, but rather as the delineation of the secular trends in the growth of each

of the structures and functions calculated for each individual child from the fluctuating data he yields. Such a conception of normal development would yield essentially dynamic norms and would lead us to study the coördinations and discrepancies in the various lines of secular trend that might be calculated for each child.

One promising approach to the study of individual child development is the systematic study of the placement rank or order of different characteristics of a child at frequent intervals. It is evident that with respect to his contemporaries, a child will occupy various placement ranks or orders that will change from year to year and that these changes in themselves are significant of how that child as an individual is developing. This would be revealed in the changing rank or order for each characteristic and in the changing profile of all these changing placements (3).

The study of child development along these lines would probably show that at different epochs in the child's career there were different centers of dominance; *i.e.*, different structures and processes would be changing more rapidly than others, as revealed by greater amplitude of fluctuation and more sharply sloping lines of secular trend. Thus, during the life of the child we should expect to find a structure or a function increasing or decreasing up to a certain point where it would remain stationary, not only relatively but absolutely, while the lagging structures and functions caught up with this more precocious factor, as it were.

We would expect to find in the

growth of the child, and we do find, nodes which, from this point of view, may be interpreted as occasions when the secular trend of the different structures and functions are fairly coördinated. Undoubtedly, in so complex an organism as man, there may be various centers of dominance since the phylogenetic record indicates the probability that man as an organism arose by confederation as well as by conquest so that we find certain systems and structures participating in the total organism but nevertheless retaining a degree of independence, reminders of their one-time freedom from organic domination. Here we may refer to smooth muscle and the vegetative nervous system which retains so large a measure of independence, as indicated by the name—autonomic nervous system.

It is appropriate here to point out two apparently divergent trends in development of the human infant. In activities of overt behavior, such as motor activities, the developmental sequence appears to move from total organic, all-over type of activity toward progressive differentiation of activity and subsequent integration, as seen in acquisition of skilled patterns of prehension and so on. While there are many unsolved questions here, the general movement seems to be that indicated, wherein bodily segments emerge as capable of separate activity from a previous organic complex.

In functional activity the reverse movement appears to obtain. The infant begins life with a number of physiological processes operating with relative independence of rate, efficiency and outcome, so that development

brings a progressive coördination of these organ systems into a functioning whole.

Individual development may therefore be viewed as occurring through a progressive resolution of these divergent, if not conflicting, processes. Integration, in the light of this discussion, may be conceived as the goal of child development, within the limits which the current state of development of organic unity makes possible. Integration must be regarded, therefore, not as a movement toward static coördination and normative adjustments, but emphatically as a movement toward organic differentiation and coördination whereby structural and functional autonomy yields to an integration appropriate *for that organism*. The molding of structures and the modification of functional processes and activities may then be regarded as coming about through interaction among these fluctuating magnitudes which sooner or later culminate in the attainment of a dimension in mass or extension or in a range of fluctuations which is a function, mathematically, of the total organic situation. During the period of growth of the organism, there may be a struggle for domination among the various structures and processes, which struggle is revealed in these fluctuations as the different systems are gradually brought into a coördinated interrelationship among themselves. The large initial fluctuations in the infant reveal this lack of organic unity and coördination and dramatically portray the competition of the several processes and functions for the maintenance of their independence. Again in adolescence we see

instability of functional activity as growth takes place. But in later adolescence, these wide fluctuations gradually subside as the several structures and processes increasingly participate in the total organic complex and are brought under the governance of whatever dominant structures and processes manage to obtain dominance during the movement toward maturity.

#### IV

The individual personality may be regarded as the product of inheritance and of this developmental process wherein the idiosyncrasies of the individual organism's integration have become cumulative with growth to maturity. At the present moment, we are becoming increasingly concerned with the study of personality and with the investigation of constitutions and types. For the most part, these studies are attempts to elicit from the records of mature, adult individuals certain categories or groupings among which different individuals may be classified, or attempts to correlate physical measurements with certain traits or characteristics. It is believed that the study of child development along the lines herein indicated offers a more fruitful method of attack upon this problem since it is evident that any distinguishing characteristics of personality or of constitution must at some time in the career of the individual begin to appear, perhaps with a scarcely noticeable degree of difference from the other factors in the organisms but destined to assume an ever-increasing magnitude. To illustrate, through the work of Kretschmer and

Van Horst in Germany and of George Draper, Stockard, and others in the United States, attention has been directed to the long-thin, or asthenic type, and the short-fat, or pyknic constitution or type, and the apparent susceptibility of the long-thin type to gastric ulcer and schyzoid personality, and of the short-fat type to gall-bladder disease and cycloid personality. It is submitted that these proposed constitutions or types represent the end results of processes which start during the development of the child.

It is important here to consider the probability that the differential rates of growth in the child and youth may generate these conditions of disease and susceptibility as organic liabilities arising from discrepancies in the rates of growth. Thus, one adult form may be indistinguishable from other adults because there is no clear-cut differential or sharply defined bi-modal or tri-modal distribution. Nevertheless, the growth processes in the adult individual found at one extreme of a frequency distribution may have been quite different from those individuals found in the center or at the other extreme. This suggests the possibility that constitutional types may be delineated by the genetic method of studying the development of the individual child to maturity, seeing in the differential growth of structures, functions, and activities of each child the *process of constitutional organization*. Thus, the inability of investigators to establish types in adult subjects leaves open the possibility of identifying growth types of even greater significance and clinical utility. To



illustrate, two individuals may at adult age show relatively minor differences in bodily dimensions so that in an adequate sample of adults those differences are not significant of valid differences. Nevertheless, one adult may have reached those dimensions at fourteen to sixteen years of age (the so-called anthropoid growth pattern), while the other may have approached his adult stature and girth by a leisurely development over four to six years. Obviously, the first individual may have been exposed to all manner of stresses, strains, and maladjustments by reason of this accelerated growth in stature and possibly retarded growth in functional efficiency (e.g., heart, gonads, et cetera), while the other, slowly growing adult may have escaped such distortions and asymmetries. Without this genetic picture of their development, we cannot hope to distinguish constitutional types or begin to understand how mental and physical diseases are characteristic to different kinds of individuals whom we can identify clinically but not establish statistically. Moreover, we cannot interpret our clinical findings on individuals by reference to age norms, since each individual organism is an aggregate of maturities only rarely coincident with chronological age. What is of real significance is *the individual's own range of variability or fluctuations in functional processes, susceptibilities and immunities*; if he exhibits swings or perturbations of unusual degree in one function and greater or lesser swings in other functions, this condition of organic incongruity may be of greatest significance although he shows no pronounced

deviations of single functions from so-called norms. This is clearly shown by the studies of R. G. Hoskins and associates on schizophrenics at Worcester State Hospital where few significant deviations from clinical norms of single functional activities have been found, but where the individual exhibits pronounced idiosyncrasies in individual functional activities and in his total organic functioning, characterized by Hoskins as "physiological clumsiness." Such individuals may be regarded as having failed to achieve organic efficiency due no doubt to circumstances of the growth processes wherein hereditary factors may be of large import.

The problem of identifying constitutional types is therefore to be viewed as a *genetic problem* of discovering the divergent paths followed to maturity by different individuals who at maturity may defy segregation into types upon the basis of end-products or dimensions but who carry within their organic constitution the consequences of their idiomatic growth and possibly skewed development.

The development of the individual personality as arising from this process of discrepant growth offers large possibilities for study. Instead of attempting to measure personality directly, we can delineate personality development as a derivative of these primary, measurable changes, a way of integrating these skewed and asymmetrical processes and structures and their interrelations within the socially sanctioned patterns of culture (4).

The foregoing indicates that by studying child development through the intensive investigation of the vari-

ous structural and functional changes we may approach delineations of personalities, constitutions, and types with much more promise of understanding their evolution than in the statistical study of large numbers of adults exhibiting end results of these changes. Moreover, it indicates a manner whereby we may genetically approach the delineation of the four panels suggested by Draper—namely, anatomical, physiological, immunological, and psychological—and discover the interrelationships as the differing expression of varying processes of organic development.

One of the obstacles to the study of child development as here conceived is the preoccupation of the participating sciences with the problem of the relation of two variables as measured at one instant of time and the problem of causation (2). These preoccupations have led to a neglect of the concept of time and methods for analyzing time series. Also they have discouraged efforts to analyze data obtained by different disciplines from the same child, as violating scientific canons.

Time is generally conceived as a variable, but it is also a process; that is to say, physiological time is a process of irreversible change that is of critical importance in study of child development. As Dr. Carrel has pointed out physiological time (1) is in the organism and it differs from physical or sidereal time in not having a constant rate. As the time process is observed in organisms, it appears in the operation of all physiological functions, giving them a different character as the duration of the organism increases.

The neglect of time in our thinking and research work is evident in the lack of any clear-cut conceptions of physiological development of an organism; it cannot be measured merely in increase of magnitudes as we are accustomed to think in structural development. Thus we must consider physiological development in other terms, such as increase in functional efficiency (*i.e.*, chemical efficiency of secretions per unit of time or substance) or as stabilization of functional activity or perhaps as coördination and integration of one functional process with other functional processes. The concept of maturation of function offers a promising lead here.

The conception of time is, as suggested, critical for our formulation of the problem since we may, by misconceiving time, create artificial problems that can never be solved, as so often has happened in scientific work. An example of this is seen in the assumption so frequently made in child research that a period of time, day, week, month, or year, is a constant for every stage of child development and that children of the same age are a homogeneous class. These differences in the value and meaning of duration for each stage of organic growth are the very essence of what we call development as distinguished from growth measured in terms of increments per unit of physical time. Dr. Carrel says each human being constitutes a relatively independent world in a state of continuous transformation. It is the rate of this transformation that can be assumed to characterize our specific duration.

From this point of view the problem



of child welfare may be viewed as the discovery of a technique for child care whereby we may try to synchronize the various changes through which the child must pass on his way to adulthood so that he may achieve maturity with the least amount of asymmetrical and uncoordinated development. It may be pointed out in passing that for the most part of our notions of child hygiene are by-products of diagnostic and therapeutic work, and thus far we have little experimental basis for child hygiene. Approaching the problem of child hygiene and child welfare with this concept of development and along these suggested lines of procedure, we see that there is presented an extraordinarily rich and unexplored field of experimentation—namely, to discover and to work out into practicable form the techniques of child care suitable to each of the varying classes or types of children and adapted to the varying needs and requirements of the different periods of the child's development. As suggested before, we may regard the human infant as a relatively unorganized and unsteady aggregation of changing structure and functions which must, if the child is to survive, be brought into some sort of organic unity. We may, therefore, view the development of the child to the pre-pubertal age as essentially a movement toward relative stability. The onset of puberty then may be regarded as the breakdown of this painfully achieved stability as necessary to adolescent growth. Immediately the problem of adolescence may be stated in this wise: to discover the order or sequence in which structures and processes undergo the pubertal modifi-

cations and disturbances with the probability that we can find certain constitutional types or large groupings of individuals for whom this pubertal breakdown and subsequent integration always takes place in the same manner. Then we are faced with the question of whether for each of these types there may not be a more or less fixed sequence of increasing instability in the sense that the initial "break" may take place in one function or structure and be followed by successive breaks in other functions as a patterned sequence peculiar to each constitutional type. Pursuing this notion further, the movement from puberty to maturity may then be viewed as the achievement of the "steady state" of maturity by the progressive stabilization of processes and functions in a sequential pattern peculiar to the constitutional type under which each individual adolescent would be classed, remembering that all manner of retardations are, so to speak, frozen in maturity—*e.g.*, bone growth. Under such a conception, we might envisage a coöordinated attack upon the problem of adolescence as has been suggested in the study of the infant and the younger child, and again we might anticipate the development of a technique of hygiene for the adolescent based upon the discovery of these constitutional differences and the application of methods which might help the adolescent to achieve health and sanity in maturity in accordance with the needs and capacities of his own organic situation. It seems evident that if we are to have anything in the nature of preventive medicine, we must look forward to an increasing recognition

of the individual's variability and his peculiar needs and requirements for the achievement and maintenance of sanity and of health. The study of child development along these lines as essentially the genetic branch of

human biology, is, therefore, offered both as a program of fundamental scientific importance and as an outline for larger social welfare of an importance sufficient to justify this rather extended discussion.

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# A Study of the Speech of Eight Bilingual Children of the Same Family

MADORAH E. SMITH

**I**N A study of height and weight in three generations, use was made of the diary records kept by Mrs. F. M. Smith of the development of her eight children (1). These records also contained considerable data relative to the learning of language by the children. As all of the children were born in China and,—except for one year in America when their parents were on furlough,—lived there until the youngest child was almost twenty months old, during which time they were exposed to and used two languages, it seemed worth while to study the records carefully to see if they would throw any light on the linguistic development of bilingual children.

These records had been kept from the time of the birth of the eldest child until after the removal of the family to America; but unfortunately are rather scanty before the eldest child's third birthday and after the move to America. The portions of the record relating to speech consist of comments on the children's progress, lists of words known at about a year old, age of first real words used, and quotations of the children's remarks and questions that for different reasons interested the mother and seemed worthwhile recording. The quotations listed before the children were four-and-a-half years old

numbered about four hundred and fifty sentences and almost twenty-five hundred words. This made possible a numerical analysis of the sentences at different age levels. As there was no consistency in recording sentences other than the interest aroused by the child's remarks and the mother's opportunity and leisure to do so, the assumption is that the samples are of the child's best attempts and the data are not therefore comparable to other studies where the records have been made more systematically. However it is possible to compare one child with another as the selection of samples was subject to the same factors for the different children. Such comparisons make it possible to consider the effect of certain factors which affected the children differently; for the ages of the children at the time of furlough and removal to America varied and there was a difference the mother states in her own use of Chinese with the older and younger children.

The children while in China heard Chinese always from their native nurses, the other servants and from practically all the Chinese, whether children or adult, with whom they came in contact. They heard English almost entirely from all their adult and child white acquaintances, it was the

language preferred for use among themselves after differentiation between the two languages had occurred; and, in the case of the older children, was the language primarily spoken to them by their parents. But in the case of the younger children, the mother left more of their care to the native nurses while she engaged in mission work and the instruction of the older children. She and the father also used Chinese much more in speaking to the children after their return from furlough. It may be seen therefore that there was a difference in the source of the two languages as heard by the older and the younger children; for the former, the two sources were quite distinct, English from all the whites in their environment and Chinese from all the natives in their environment; while for the latter there was no pure source of English as their parents used either language in speaking to them and there were always one or two children a little older who were still somewhat confused in their use of the two languages. This difference might well lead to increasing the infant's difficulty in learning to distinguish English and Chinese.

In order to make the analysis of the records as objective as possible, the sentences were analyzed according to 5 criteria; sentence length, number of errors per hundred words, number of inflected forms of English words in proportion to the total number of English words used, the percentage of mixed sentences, by which is meant those sentences containing words other than proper nouns from both languages, and finally the percentage of Chinese words used. The material

was separated according to the age of the child at time of record, all sentences spoken between the ages of 21 months 0 days and 26 months 29 days being counted as spoken at 24 months and so on for each six-month interval. In order to isolate the factors operating on the children to a different extent, the material was considered separately for the three oldest and five youngest children and also for each of the three children who moved from a bilingual environment to a monolingual environment or vice versa before they were past three years old.

Sentence length and number of errors per hundred words have been used in previous studies (2, 3, 4, 6) as criteria of progress in speech; and give consistent results in the present analysis, even though the samples when so subdivided are small. Sentence length increases regularly with age for each child or group separately studied and the number of errors per hundred words shows a decrease at each age level in the larger groups and at only one level in each of three of the remaining four groupings is there an increase instead of decrease with age. The increase is probably due to the smallness of the samplings. These 2 criteria treated Chinese and English words, sentences and errors exactly the same.

The third criterion that of ability to use correctly inflected forms also gives quite consistent results after two years old. It is not a very satisfactory measure especially with small samples at that age as the baby's frequent use of a few words learned in an inflected rather than a root form, e.g., "gone" hardly indicate knowledge of the use of inflections and yet by the method of count-

ing used would give the child a score. Chinese inflections are so different that they were considered separately. There was no progress shown in such use by a comparable measure but the Chinese samples were too small when subdivided by age to be considered except in the case of the younger boys for whom percentages calculated for their Chinese words as had been for the English words gave scores of 8, 6 and 8 per cent at eighteen, twenty-four and thirty months old respectively.

The percentage of mixed sentences is a useful measure of the confusion of the children between the two languages and shows regular decrease with age. The proportion of Chinese words at the earlier ages reflects the child's comparative knowledge of the two languages but at the later ages it measures rather the proportion of Chinese words still used when the child was trying to speak English for there is only one sentence primarily in Chinese recorded as spoken after a child's third birthday. This probably reflects both the mother's preference in keeping her records in English and the children's tendency to use English in speaking to their mother.

Table 1 gives the results of this numerical analysis. The mother's comments agree in every case with it. Thus she reports M.'s slow progress in speech before her second birthday, that E. whose record is included with the younger boys was by far the slowest of all her children in learning to talk, and remarks on the high percentage of Chinese used by the younger children during their second and third years.

The order of birth of the children was first the two elder daughters, next

J., then M. then the three younger boys, of whom E. was the last and then the youngest girl H.

Considering the factors that affected the children differently, the first comparison may be made between the older and younger children. It will be noted that at every age level the older children excel the younger children by all criteria; with one exception, inflections at two years. They use longer sentences, make fewer errors, make greater use of inflections, and use fewer mixed sentences except at three-and-a-half years where very few are used. The average age of end of true confusion is earlier for them also although the age of last mixed sentence is about the same. But these last mixed sentences hardly show confusion of the two languages as the earlier mixed sentences do for with but one exception (E.'s), each contains but one Chinese word which are either words for which there is no true English equivalent or words which, for some special reason, the children had been taught to use instead of the corresponding English word. Words of the first class occurring in these last sentences are "mei-mei" or "younger sister" and "koo-koo" or "elder brother"; of the second class are "du-bi" or belly "sz-poo" or diaper. The children were encouraged to use Chinese words to refer to portions of anatomy, calls of nature and articles of clothing tabooed in polite conversation in English in the nineties. The other last word "din-ts" or quilt was currently used in the nursery to distinguish certain small crib pads from the regular bed quilts. Such mixed sentences containing only such words are of a very different type from E.'s

TABLE 1

*Numerical analysis of the speech development of the bilingual children from the age of one to four years*

	AGE	I.	OLDER GIRLS	M. H. AND R.	YOUNGER BOYS	THREE ELDEST CHILDREN	FIVE YOUNGEST CHILDREN
	<i>months</i>						
Sentence length	18				H. 1.7		
	24	2.5	3.5	2.0	4.1	2.1	2.6
	30	4.5	4.0	3.6		2.5	3.0
	36	6.7	7.7	3.9	E. 5.6	7.4	5.3
	42	7.4	8.0	4.6	3.7	5.5	7.8
	48	9.0	9.7	7.5	6.6	6.4	6.8
	Av.	6.0	6.4	4.3		4.4	4.8
Errors per hundred words	18				H. 63		
	24	40	14	70	37	41	29
	30	12	18	31		65	15
	36	0	9	51	E. 8	7	15
	42	0	8	9	8	4	5
	48	0	1	3	0	1	0
	Av.	10	10	33		24	11
Inflected words per cent of Eng. nouns, verbs and modifiers	18				H. 2		
	24	0	0	12	5	11	0
	30	13	15	3		21	14
	36	17	19	18	E. 16	18	18
	42	19	22	23	31	16	21
	48	26	21	11	25	13	22
	Av.	15	15	13		15	15
Mixed sentences: Per cent of sentences con- taining both Chinese and English words	18				H. 28		
	24	0	0	0	10	28	0
	30	0	18	16		19	9
	36	0	6	7	E. 6	4	6
	42	0	1	0	0	0	1
	48	0	0	0	0	4	0
	Av.	0	5	5		11	5
Proportion of Chinese words recorded as spoken by the children	12	27	17	0	H. 68	53	73
	18	20		0	50	56	—
	24	0	0	16	2	76	0
	30	0	4	9		28	2
	36	0	2	2		2	1
	42	0	1	0	E. 0.4	1	0
	48	0	1*	0	0	0	0
	Av.	0	3	9		21	1
Average age at which confusion of the two languages ceased	Before 24		29	30	H. 22	33	
Average age of last recorded mixed sentence	None		39	38		40	

Averages do not include data below the age of 24 months.

\* The Chinese words were proper nouns which could not be given in English.

sentence recorded as spoken at 35 months referring to the snow, (a rarity for him and for which he knew no word) "Jingming's bah sand makes my kyouth t'ung" which translated would read "God's white sand makes my feet hurt." The order is Chinese, the words about half English and half Chinese and the English inflection is attached to a Chinese noun. Is it any wonder that "Grandma does not understand much that E. says" when he visited her in America at 38 months although he was recorded as speaking better English and forgetting Chinese by 39 months old?

This superiority of the older children is not accompanied by any compensating superiority of Chinese on the part of the younger children for all the criteria but the one showing least difference take the Chinese as well as the English into consideration. We may therefore conclude that the confusion of source of languages does probably make learning to speak more difficult for a bilingual child than if the sources are reasonably distinct.

Considering next the effect of removal from a bilingual to a monolingual environment. J., the oldest boy and H. the youngest girl were both so removed at about 20 months old. Both of them had made considerable progress in speech by that time, the record stating that J. at 18 months was talking a good deal and that H. at 14 months was talking a good deal in Chinese and using short sentences at 19 months. She had begun to talk the earliest of all the children using six words at eight months and combining two words into her first sentence at nine months. Within two months

after leaving China, she was beginning to pick up English and using less Chinese. In neither case was there a record of any mixed sentence after the children's second birthdays. At that date, H. was taken from her family for a two months visit to an aunt after which she no longer used any Chinese. J. however heard it occasionally in his family during the year of furlough and had no difficulty in recovering his Chinese upon return there. H.'s record at two years covering as it does all sentences used from 21 to 27 months covers this period of forgetting and her transition from bilingualism to monolingualism. Her record is given separately therefore as well as included in the record of the five youngest. Unfortunately after that period there is only a single sentence quoted. Dividing her two-year record into two parts by the date of her leaving for the visit to her aunt we find for the first interval a sentence length of 3.1, error index of 62, and a single use of inflection, that of the possessive sign; and for the latter period a sentence length of 5.0, error index of 20 and the same use of inflections. Her progress as she became adjusted to the monolingual environment was remarkable. These children do not show the difficulty that Mary and Avis Ann and a third infant reported to me (5) did when they underwent a similar move but they were younger and had not made the same start at learning to talk that J. and H. had.

The early speed of acquisition of words by the children, the fact that the average of the children's first use of words was ten months and in this respect the younger children were



ahead of the older (they first used a word at an average age of ten months and the oldest three at eleven months) suggest that the handicap of bilingualism is not felt at this stage but a little later and it is when the child is about eighteen months old that comments on slowness of further progress occur in the records of those who seem to be most handicapped.

M. was moved from China to America at a few weeks old and started learning to talk in America. At 13 months she used five English words. The next month the family returned to China and her exposure to bilingualism began. Her record shows relatively slow progress and the mother comments upon it. Finally at 19 months she remarks that M. has picked up a few Chinese words and at 21 months she begins to improve, "learning a new word almost every day." At two years she does not show any mixed sentences but a low per cent of such sentences is inevitable when the child is still using many one-word sentences as it is necessary that a sentence consists of at least two words before it can contain words from two languages. The transfer from a monolingual environment to a bilingual environment may be more confusing to an infant than the reverse and it is also noted that M. was younger than the two who made the reverse change.

E. is another child who had not mastered speech when the family moved to America. After the decision to leave China had been made, the mother states that she made a special effort to speak Chinese more than ever to the younger children. As a result (?) E. was the oldest of the children to con-

tinue his confusion of the two languages. He had been in America nearly three months before the record of his forgetting Chinese occurs. At 42 months nearly half a year after leaving China his sentences are 3.7 words in length, error index is 31 and use of inflections occurs in only 8 per cent of the words, the poorest record of all the children. Were it not for his previous low record and the slight disturbance caused the other two children moving to America at an earlier age and the additional fact that the younger of the two oldest girls who was only a little older than he during the furlough year in America shows no effect of the change, we might consider his slowness due to the change. It would appear more likely due in part, at least, to the same cause that affected the other younger boys, namely the confusion of source of English and Chinese. He had made considerable gain by four years as shown by the last quotations in his record. He made excellent progress when he started to school and his intelligence rating on the Army Alpha during the World War was A so his early slowness was not due to less intelligence than his siblings.

This analysis suggests that:

1. It is probably better for young bilingual children to receive their two languages from quite separate sources, each adult in the home using always the same language in speaking to them.

2. Change from a monolingual environment to a bilingual one affects a child's speech more than a change in the opposite direction.

3. Such changes are more difficult for an infant of twelve to eighteen



months than for those who have already made more progress in speech.

4. A bilingual environment does not seem to delay the first use of words, the handicap operating at a later age.

5. Although the numerical data cannot be compared with other studies of children's speech since the samples are

probably selections of the children's best effort rather than of their average performance, yet the ratio of errors is in case of the younger children higher than the norms of two and three-year-olds found in a previous study, (6) (two years 36 and three years 15 per 100).

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# Direction of Movements of Children in Emotional Responses

DOM GREGORY J. SCHRAMM

## HISTORICAL INTRODUCTION

**T**HIS experiment was devised to investigate to what extent, if any, the reactions classified as positive and negative reactions in studies of lower organisms may be important in the study of the emotional behavior of children; and to find what relation, if any, exists between spatial factors in the environment and the general reaction pattern of children under conditions that are generally considered emotion provoking. The problem may be briefly enunciated as follows: What is the direction of gross body movement of children to spatially controlled stimuli? Does this direction of movement indicate emotion?

The idea of spatial reaction as an index of emotional behavior has been slowly developed in child psychology. Watson (9) introduced the positive and negative terminology into experimental child studies. He has a paragraph caption "(9) Positive Reaction Tendencies." He writes, "infants respond positively to nearly all small objects which are given a high stimulation value by moving them. No definite avoiding tendencies have been noted at this age, except those mentioned under blinking and defense reactions. . . . Although we are not prepared to insist upon it we are in-

clined to believe that man is originally endowed with various kinds of positive reaction tendencies, but with few negative reaction tendencies."

Watson's eighth trial of "Albert" is described as follows: "The instant the rat was shown the baby began to cry. Almost instantly he turned sharply to the left, fell over, raised himself on all fours and began to crawl away so rapidly that he was caught with difficulty before he reached the edge of the table." Of this reaction Watson claims "This was as convincing a case of a completely conditioned fear response as could have been theoretically pictured." Generalizing on Watson's three emotions Tolman (8) states, "It must be observed that all response tendencies would apparently fall into one or the other, of the two classes of 'tending to remove' or of 'tending to continue and get more of' the stimulus. Anger and fear go into the first group and love in the second." But these classes translated into environmental terms are equivalent to reactions which decrease distance and make contact or increase distance.

Sherman (7) also detected this bipartite behavior reaction in infants and reduces all behavior of the newborn to the categories of the positive or negative reactions. He writes thus:

"The genesis of the specific emotional reactions of children and adults lies in the responses available to the newborn infant. The reactions are first generalized, but even in the earliest responses two types of reactions are noted: (1) that of rejecting the stimulus, and (2) that of accepting the stimulating condition."

Leslie Marston (6) makes positive and negative spatial movements of children a significant basis for measuring social resistance and compliance. Making a summary of results, he writes "In this experiment the children differed in degree of social resistance from the most extroverted, who showed no resistance but unhesitatingly approached the stranger and uninvited played with the toy (score 5) to the most introverted whose social resistance withstood the stranger's advances and rejected his inducements (score 0)."

Spatial specifications and relations have been used by Levy and Tulchin (5) in the description of resistance behavior of 983 children tested at a county fair and of 110 others tested under controlled conditions in the laboratory. In the first study they conclude: "The manifestation of resistance by infants and children during mental testing is evidence of some innate behavior pattern." In the second study the authors analyzed the resistance behavior into 8 pattern groups, the sixth of which contains the following: "Several withdrawal movements with or without taking the object; walking back to mother; turning head and burrowing in mother's clothes; turning head away toward mother, holding head downward,

covering face with hands, looking away."

The presence or absence of a positive spatial reaction is the criterion of scoring most items of Gesell's (1) maturity chart for one-year-olds. These items which he considers symptoms of developmental levels, are all, except one concerning speech, reducible to spatial movements of the infant in response to a stimulus object. The same criterion of scoring maturity is found in his scale for pre-school children (2).

M. C. Jones (4) while eliminating fears from children found that the "direct conditioning" was the best method of elimination. It should be noted that in this process the spatial relation of the animal was at every stage of the process the measure of the emotional equilibrium of the children being unconditioned.

According to a study of H. E. and M. C. Jones (3) jumping frogs, jack-in-the-box, and upsnapping beetles most frequently elicit fear reactions in children, while worms and caterpillars produce no more than mild curiosity. The difference in these groups of stimuli lies in the sudden and extended locomotion or spatial changes of the former compared to the latter.

In an experiment with six young children, thirty-six older children ranging from six to 10 years and 90 collegiate adults in the presence of a harmless snake 6 feet long and 4 inches in girth, these authors describe the reactions largely in spatial terms. Some of the terms are the following: "reached and grasped," "held his ground," "started to leave," "took up a post of observation outside of pen,"

"drew away," "moved forward," "crowding close," "climbed on table," "refused to come near," "ran around behind the circle," "nearly one third refused to have the snake brought near," "the remainder reached forward." Broadly the whole array of subjects in an emotional situation are divided into those who permitted the object to be near or reacted positively and those who acted in a contrary manner.

Apparently positive and negative reactions are characteristic of the behavior of children in responding to stimuli that provoke emotion. The aim of this study is the experimental determination of the positive and negative reactions of children under conditions that vary the spatial factors in the relation of the child to the stimulus.

#### PROCEDURE

It was desired to present two situations, one in which the subject was placed free in a spatial relation to a stationary stimulus object and the other where the child was relatively stationary while the stimulus was moved toward or away from him.

For this reason two tests were devised. The one called the Sitting test, in which the child was fixed in a chair and animals as stimuli-objects, were moved toward and away from the child. The second test was the Standing test, in which the controlled conditions permitted the child to stand freely in space in the presence of animal-stimuli which were relatively fixed, on a table.

Thus both tests reveal body movement of the child in space. The sitting test provides observation of small

spatial trunk swaying of the child in the chair, under controlled conditions. The standing test gives a record of the gross spatial movements of the walking child with the stimulus object restricted.

The reactors were children from the Child Institute of the Johns Hopkins University. There were 22 reactors, 15 were boys and 7 were girls. Their ages ranged from thirty-six to sixty-four months. Twenty of these participated in the standing test. The Intelligence Quotient of each was above 1.00. A few refused to submit to the chair situation; a few entered after the completion of the standing test. As a rule the child freely said "Take me" and tended to run ahead of Experimenter into the experiment room but in the cases of A and R it was necessary to coax. N could not be induced to walk through the corridor to the observation room unless accompanied by an institute assistant.

#### *Apparatus for sitting test*

The sitting test involved a relatively fixed subject and a moving, *i.e.*, approaching or receding stimulus animal. Actually the child could move several inches each way in the chair. The stimuli were moved through a distance of 24 inches, in three or six inch intervals, toward or away from the child. The movements of child and of stimulus were mechanically recorded.

The apparatus for the sitting test is illustrated in figure 1. It consisted of a chair with a back, two arm rests and a front tray, something like a baby high chair. The rigid parts of the chair in contact with the body, that is, the back, the sides and the

front were equipped with an air cushion for each. These 4 air cushions made of inner tube sections were connected by separate tubings with 4 individual pressure bulbs and recording tambours; thus forming 4 closed pneumatic systems. Any body movement of the sitting child in a ventral, dorsal or lateral direction was trans-

kymogram the opening and closing of the drop-curtain and the exposure of the stimulus at the initial position.

In the back of the stage an opening equipped with 2 points of an electric circuit was made at the center at the floor level. Fitting into this opening and moving through it was a one inch wooden rod equipped with circling

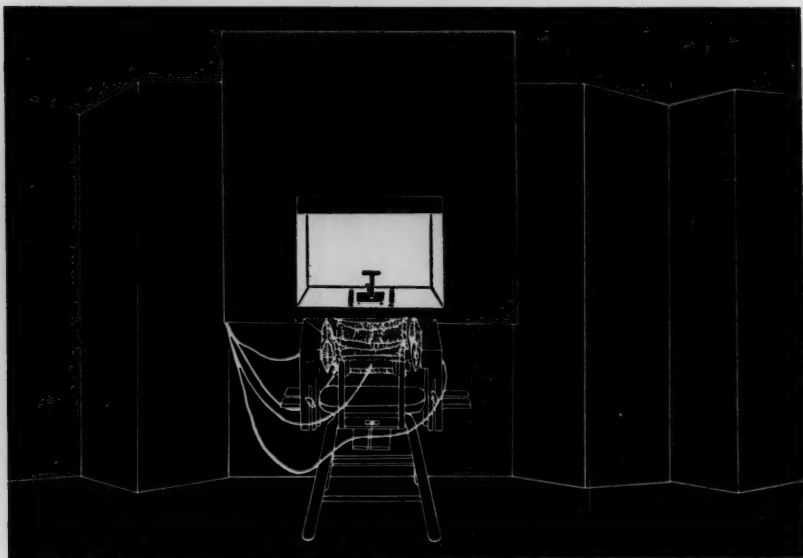


FIG. 1. APPARATUS FOR SITTING TEST

mitted to the respective tambour and there recorded on a kymogram.

The exposure apparatus or stimulus-stage consisted of a small stage having a cubic extension of 2 feet, built upon a table. The front of the stage was equipped with a screen which could be raised or lowered at will by the Experimenter to expose the stimulus object. A metallic point on this screen automatically recorded on the

bands of zinc, at every three inches to record the movement of the rod. When the tray bearing the animal stimulus was moved forward or backward by means of the rod projecting through the rear stage wall, the metallic rings closed the electric circuit and the position of the stimulus tray was kymographically recorded. A scale in inches was marked on the rod carrying the stimulus which was moved

forward or backward on the stage by the Experimenter standing behind the screen. A stop watch was used to make the intervals between stimulation at given distances uniformly 30 seconds. The exact time interval was mechanically recorded on the kymogram. The illustration shows the animal tray equipped with a small perch for the paroquet experiment. The other animals were bound to the tray.

In the ceiling of this small stage a mild electric bulb was placed which shone down upon the stimulus object and afforded uniform illumination at all times.

The recording apparatus consisted of a kymograph and 6 markers, 4 of which were pneumatic and 2 magnetic. The 4 pneumatic markers were tam-bours, one each for the 4 air-pressure cushions acted upon by the movements of the child in the chair. On the kymogram the top or L line shows the record of the left side movements or compression by the moving child, the R line represents the right lateral movements, the V line the ventral pressures, and the D or fourth line the dorsal compressions.

The 2 magnetic markers were activated as follows: The fifth marker or time line was operated from a continuously running electric clock in an adjoining room; the bottom marker recorded the raising and lowering of the exposure screen and the positions of the stimulus rod and animal.

*Stimuli objects.* The stimuli objects were animals. The introductory stimulus was a ten inch glass bowl containing 2 gold-fish, each 2 inches in length. This was used on the regular

exposure stage with the air-cushions under compression.

The other stimuli were, a small green frog, 2 ounces in weight; a large market frog, 11 ounces in weight; a white rat, body 6 inches long; a gray rabbit, 4 pounds in weight; and a green paroquet 6 inches long.

These animals were attached to the stimulus-rod and moved toward or away from the child sitting in the chair. The frogs were fastened to the tray by means of strings tied to their legs and hands, which made hopping impossible. The rat and rabbit were held in place by a wire passed around their neck and fastened to a ring between their fore legs. These bands were quite invisible, and were not once remarked upon by the child-subjects. The paroquet was trained to sit on a perch while being exposed. However it was prevented from flying away by a fine eye-glass chain which was passed around its leg and attached to the perch. The chain was quite visible. Except for the frogs which slowly writhed on their tray the stimuli animals were quiet, and never moved off their tray during exposure.

*Procedure of the sitting test.* In the beginning the Experimenter addressed a group of children as follows: "I want to show you something next door. I will be able to take only one at a time. It is now —'s turn." Later the appointments were made through the Institute assistants in order to avoid disturbance of group activities. The same arrangement applied when the subjects were taken from the playground.

On arrival at the test room, the

subject was asked to take off outdoor top-clothes if he had them on, was engaged in a casual conversation about the room and permitted to play for a minute with a new toy; then asked to sit in the chair. He was told "In a few minutes I will show you something in that window."

The child was permitted, even encouraged to get in the chair by himself. In case of climbing inability the Experimenter assisted him into chair, then said: "Won't you let me move the arms of the chair closer to you so they fit snugly?" and thereupon adjusted cushions. Next, "Let me put this arm-rest (tray) under your arms to make you comfortable. This fits like a baby chair, doesn't it? Do you have one at home? etc." Experimenter left subject a minute and adjusted the pressure of the 4 air systems each of which had an individual bulb. Coming back to the child, he said: "Let me move you nearer the window, so you can see the things I want to show you. Lay your hands on the tray like this." The chair was shifted in a position directly in front of the screen, as shown in the diagram of apparatus. Experimenter placed the hands palms down on the tray in a relaxed position, then said, "Now I'll go and open the window for you to see what is there."

When tambours were balanced, the child was asked, "Are you ready?" and the kymograph was started. After counting five, the curtain was raised exposing the animal at the initial 24 inch distance, stop watch was started, and the behavior of subject was recorded in writing.

The stimulus object was permitted

to rest in a given position approximately 30 seconds and then pushed forward, not jerked, 3 inches during the space of 1 second to the next position. Such forward movements were made until the stimulus object reached the edge of the stage, or as far as the child would tolerate it. Then the stimulus object was drawn back 3 inches as every 30 seconds elapsed until the initial position was regained which was also maintained for 30 seconds, following which the curtain was dropped. At the end of the series when the drop curtain was lowered the child was immediately released by unlatching the tray of the chair. The child was then engaged in some irrelevant conversation, permitted to play with a toy for a few minutes, helped to put on his top clothes and escorted back to the playground or work-room.

The following modifications of procedure were introduced. The experimenter spoke to the child when crying seemed imminent and asked "What is it?" Usually no answer was given to direct questions as "Will he bite, jump, or fly?" In case of the child protesting and wanting "to go and get out," he was put off repeatedly by saying, "Just a minute longer." In a few cases of continuous protest, extreme agitation and loud crying the series of approaching positions was shortened and even the curtain dropped. However, the necessity of rapport, future coöperation and the welfare of the children required such individual variations of the procedure. It is our opinion that the active factors in the situation operated in spite of the shortening of exposure and approach series, by reason of a lowered reaction



threshold, in the very few cases where this occurred.

*Results of sitting test.* The data of this sitting test were treated by application of the fifth experimental method of John Stuart Mills. Mills' formulation of the law of the "Method of concomitant variations" is as follows: "Whatever phenomenon varies in any manner whenever another phenomenon varies in some particular manner, is either a cause or an effect of that phenomenon or is connected with it by some fact of causation." Simultaneous variation of position of the subjects as recorded by the tambours with that of the animal stimuli as recorded by the electro-magnets are assumed to show a causal dependence of the behavior of the children upon the spatial movement of the stimuli.

After a shellac bath, the kymographic records were read by means of a transparent triangle engraved in centimeter units. In this reading the time line or stimulus line was used as the base line. Readings of the height of the pressure line were taken for each second or each two second periods. The readings for the interval from one distance of stimulus to the next were averaged for that period. These averages were considered an expression of the directional activity for the given distance. Thus in the case of Q reacting to the rabbit as shown in figure 2, III we have

Stage, in. . .	24	21	18	15	12	15	18	21	24
Left, cm. . .	13.5	13.3	12.8	13.3	13.0	12.6	12.9	12.5	13.0
Right, cm. .	11.1	11.5	11.3	11.7	11.8	11.8	10.8	10.0	99.9
Ventral, cm.	8.1	8.3	8.1	8.7	8.5	7.8	7.2	6.8	6.8
Dorsal, cm.	2.5	2.3	2.5	2.1	2.2	2.5	2.7	3.2	4.2

*Ventral and dorsal concomitance.*  
By concomitance is meant that as the

stimulus moves successively in a forward or backward direction the subject reacts in a consistent direction that is somewhat proportionate to the movement of the stimulus by moving forward or backward or vice versa. This does not mean that such consistency existed throughout the exposure series in every case but it does mean that there was a proportionate variation in the subject's behavior in four or five successive stages. Nor does this mean that dorsal variation must always compensate or balance ventral variation and vice versa. This is due to the fact that the dorsal and the ventral contours of the body are not symmetrical, like the lateral contours. Hence concomitance is read from either dorsal or ventral data, not necessarily from both. In case of a longer series of concomitant variations one stage or measure out of proportion was not considered to destroy the concomitance.

The inches refer to the position or distance of stimulus from the child. The centimeters refer to the height of the tambour record above the base line of the kymogram. The letters L., R., V., D., mean left, right, ventral and dorsal compressions, respectively.

In the record of Q and rabbit shown in figure 2, III we note concomitant increase in the ventral pressure and a concomitant decrease in dorsal pressure as the stimulus object approaches the subject. This is a case of positive concomitant variation.

Positive variation, *i.e.*, increased ventral pressure with the approach of the stimulus can also be noted in figure 2, IV of H's reaction to the rabbit. Increased dorsal pressure is



apparent in figure 3, representing reactions of C to large frog and of D to the rabbit.

The scoring of a concomitant variation does not signify there may not have been more than one series of

laxed as the stimulus receded or may have maintained a negative summation attitude. The scoring for "none," for the absence of concomitant variation does not signify anything as to the positive or negative orientation

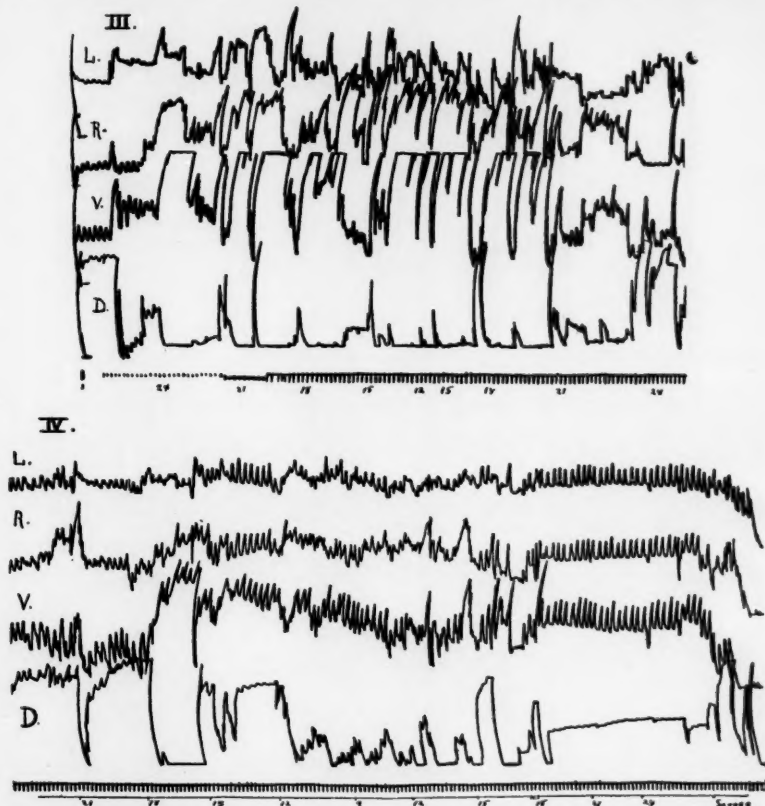


FIG. 2. POSITIVE CONCOMITANT VARIATION IN REACTIONS TO RABBIT. III, Q. IV, H

successive variations in a given test for a give individual. In case there were more than one, only one was recorded and scored. Thus a child may have been concomitantly positive up to the mid point of the series and then suddenly become negative and re-

laxed as the stimulus receded or may have maintained a negative summation attitude although there may have been such an abundance of movement as to make subsequent analysis impossible.

In obtaining these measures it has

at times been necessary to discount the first reading which occurred with

due to the eye and head raising to fixate the moving curtain, this in turn

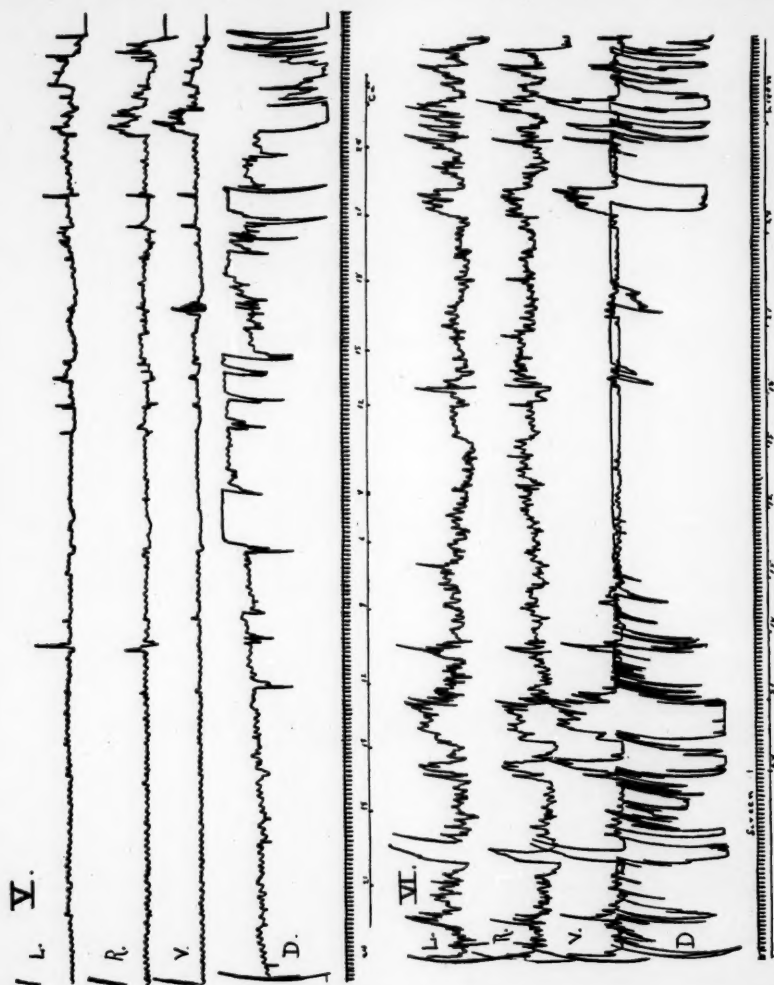


FIG. 3. NEGATIVE CONCOMITANT VARIATION. V. C TO LARGE FROG. VI. D TO RABBIT

the raising of the drop-curtain. The upward movement of this curtain usually causes a dorsal compression

adds weight to the backward balance of the body. Furthermore some children are inclined to try to peep as the

curtain starts to move. This would occasion a dorsal pressure due to lowering the head.

*Later concomitant variation.* Lateral concomitant variation of reaction is taken to be successively increasing or decreasing pressure on the left side with a decreasing or increasing pressure on the right side in proportion to the movements of the stimulus object or vice versa. Since the lateral sides of the body are symmetrical negative movements on one side ought to be accompanied by positive movements on the other side. Simultaneous positive or negative variation on both sides is an artifact due to friction of the body moving in a ventral or dorsal direction and hence can not be scored as lateral movements. Such recorded bilateral scores neutralize themselves in so far as they destroy concomitance.

A trifling source of error more frequent on the ventral side than on the lateral sides was the manipulation or finger pinching of the edges of the air cushions. Finger manipulation did not occur frequently and unless all the fingers were simultaneously involved did not introduce a notable compression variation.

Much of the lateral compression was caused by arm movements of the children while reaching for the stimuli. The arm extension and its projection tended to draw the shoulder in the same direction and similarly to move the given side of the body forward. This likewise caused a frictional pressure on the lateral cushions although the body did not move to the right or left. Obviously most of the lateral movement as recorded was of a non-concomitant frequency.

*Positive and negative reactions.*

Table 1 gives the reaction of children to approaching or receding stimuli. Obviously the fact of the presence of concomitant variation does not tell us whether it occurred in relation to the coming or the going stimulus and whether it was positive or negative. For this reason the reactions of the children were analyzed and divided on the basis of the coming and going movements of the stimuli. Movements as noted on this table do not imply that they were all concomitant but that the general trend was of an approaching, pursuing, retreating, or withdrawing pattern on the part of the subject for a certain part of the series. Many of them were of the concomitant variation type. In this table concomitant variations which reached across the central point of the series are split as is demanded by the double basis of analysis reading from 24 inches to 0 inches and on the other hand from 0 inches to 24 inches. Thus in the case of Q with the rabbit, his behavior is analyzed as approaching the coming stimulus and pursuing it when receded, hence the reaction is concomitant and positive to the movement of the stimulus throughout. This is illustrated in figure 2 and records a case of retreat to the approaching object and withdrawals from the retreating object. Figure 4,I records a negative reaction to a stationary stimulus. Figure 4,II records a highly negative reaction which lasted as long as the stimulus was exposed. One may note sharp rise of dorsal pointer after exposure and sharp drop after screen closure.

The high percentage of concomitant variation in the total of the tests shows

that there is a definite causality between the successive spatial positions of the stimuli and the reaction behavior. Not only does the stimulus cause a reaction but proportionate proximity and proportionate distance of the same stimulus causes a propor-

recording reactions of M to the white rat.

The small proportion of the concomitant lateral movements as shown in table 2 in relation to the moving stimulus shows that the stimulus did not cause lateral movements, that is,

TABLE 1  
*Cases of forward and backward movement*  
or

*Ventral or dorsal concomitant variation of children with successively varying stimulus*  
c.v., concomitant variation; none, absence of concomitant variation

CHILD	SMALL FROG	WHITE RAT	LARGE FROG	RABBIT	PAROQUET	C.V.	NONE
A	-c.v.	-c.v.		-c.v.	-c.v.	4	
B	-c.v.	c.v.	none	c.v.	-c.v.s.	4	1
C	none	none	-c.v.	-c.v.	-c.v.	3	2
D	none	-c.v.	-c.v.	-c.v.	none	3	2
G		-c.v.	-c.v.	-c.v.	-c.v.	4	
H	-c.v.	none	none	c.v.	c.v.	3	2
J		none	-c.v.	-c.v.s.	-c.v.s.	3	1
K	-c.v.	c.v.	-c.v.	-c.v.s.	none	4	1
L	-c.v.			none	c.v.	1	2
M	-c.v.	none	c.v.	c.v.	c.v.	4	1
N	none	-c.v.	none	-c.v.s.	none	3	2
O	c.v.	c.v.	c.v.	-c.v.	-c.v.	5	
P	c.v.	c.v.	c.v.	-c.v.	-c.v.s.	5	
Q	-c.v.	-c.v.	-c.v.	c.v.	-c.v.	5	
R	none	-c.v.	-c.v.	-c.v.s.	none	3	2
S	-c.v.	-c.v.s.	-c.v.s.	-c.v.	-c.v.	5	
T	none	-c.v.	-c.v.	-c.v.	-c.v.	4	1
U	none	c.v.	none	-c.v.	c.v.	3	2
V	-c.v.	-c.v.	-c.v.	-c.v.	c.v.	5	
Total:							
c.v. ....	11	14	13	18	15	71	
none. ....	6	4	4	1	4		19

c.v., 79 per cent; none, 21 per cent.

tionate or concomitantly varying behavior. Factors of space are active principles in the behavior of children in their emotional behavior. A case of the absence of any concomitant variation of the dorsal and ventral aspects may be seen in figure 5, VII

lateral movements are not an important factor in reacting to approaching stimuli.

In table 3 the ventral and dorsal pressure variations are shown for the individuals in the group when the large frog was the animal that was approach-

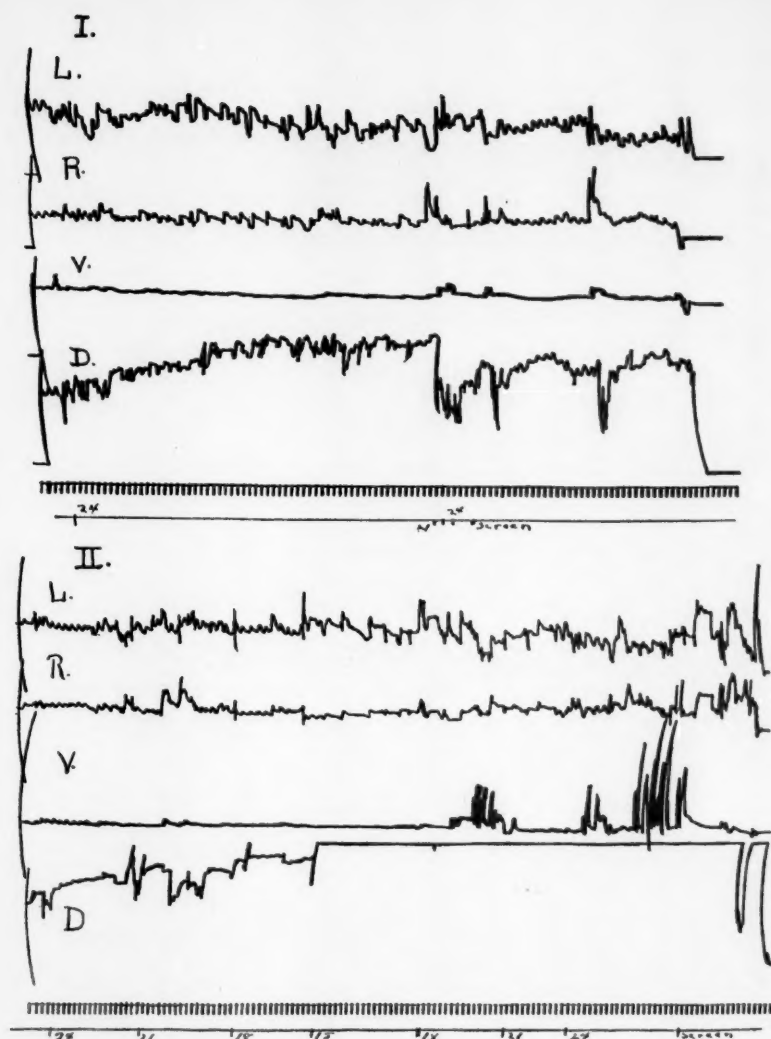


FIG. 4. NEGATIVE VARIATION AND SUMMATION. I. R TO STATIONARY RABBIT.  
II. A TO MOVING PAROQUET

ing or receding from the child in the chair. The highest point of the pres- sure line within a two second interval as recorded on the drum was read and

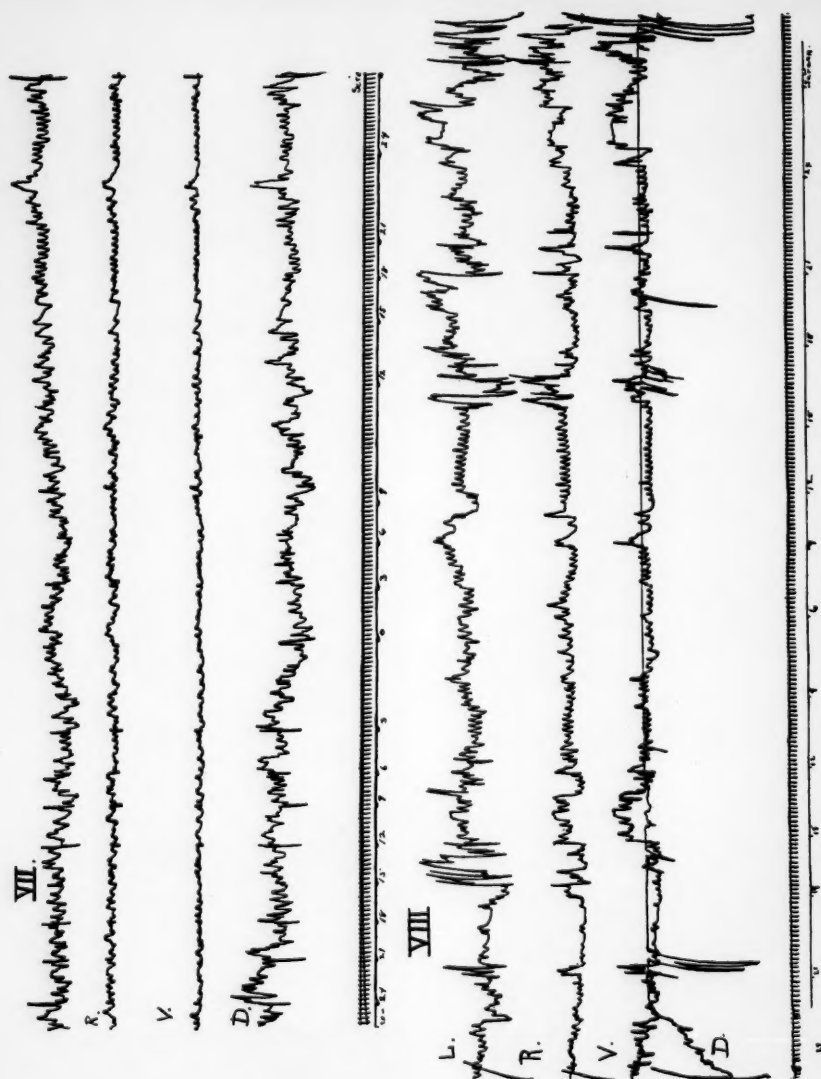


FIG. 5. NO CONCOMITANT VARIATION AND CONTINUOUS NEGATIVE REACTIONS. VII. *M* TO WHITE RAT. VIII. *H* TO LARGE FROG

listed. The average of these readings of the animal at a given distance from the child to the next presentation for the period from the presentation



at another distance was calculated. These mean scores are shown for varying distances. In figure 6 the group curves and those for individual C illustrate the variations in pressure to the approaching and receding frog.

*Reactions to different animals.* In table 4, the data show that the small

frog with those to the large frog one notes the increasing number of positive reactions to the larger frog. The larger frog also happened to be later in the series. During the interval between the testing with the small and the large frog a month had elapsed during which all but G and J had had

TABLE 2

*Lateral concomitant variation of children with successively varying stimulus c.v., concomitant variation; none, absence of concomitant variation*

CHILD	SMALL FROG	WHITE RAT	LARGE FROG	RABBIT	PAROQUET	T C.V.	T NONE
A	none	none		none	none		4
B	none	none	none	none	none	1	5
C	none	none	none	c.v.	none		4
D	none	none	none	none	none		5
G		none	none	none	none		4
H	none	none	none	none	none		5
J		none	none	none	none		4
K	none	none	none	none	none		5
L	none			none	none		3
M	none	none	none	none	none		5
N	none	none	none	none	none		5
O	none	none	none	none	none		5
P	none	none	none	none	none		5
Q	none	none	none	none	none		5
R	none	none	none	none	none		5
S	none	none	none	none	none		5
T	none	none	none	none	none		5
U	none	none	none	none	none		5
V	none	none	none	c.v.	none	1	4
Total:							
c.v.....	0	0	0	2	0	2	
none....	17	18	17	17	19		88

c.v., 2.2 per cent; none, 97.7 per cent.

frog elicited the least number of positive reactions, the second largest number of negative reactions and by far the largest number of doubtful reactions. This was the first item in the series and strangeness or novelty of the apparatus may have been operative. Comparing the reactions to the small

opportunity to react to two small frogs in the play room for a few days. In the case of the large frog, doubtful reactions are greatly reduced to one third of the number to little frog.

The white rat is the only animal which elicited more positive reactions than negative ones. This is probably

TABLE 3  
Pressure variations to large frog

REACTORS	STIMULUS APPROACHING								STIMULUS RECEDING							
	Distance in inches															
	24	21	18	15	12	9	6	9	12	15	18	21	24			
Ventral																
A	69	63	63													
B	68	65	65	62	62	60	57	62	61	66	65	63	65			
C	69	69	70	70	70	64	69	70	70	70	69	71	74			
D	74	73	68	68	68	67										
G	65	65	62	62	62	62			66	12	62	65	65			
H	62	66	59	68	62	59	61	60	60	65	61	61	67			
J	630	590	642	600	570	590			657	599	590	735	632			
K	7	7	7	7	7	7	7	7	7	7	7	7	7			
L																
M	74	71	72	75	71	73	75	72	75	75	75	74	72			
N	70	71	70	68	72	80			73	70	65	65	65			
O	71	86	79	79	75	84	92	72	82	81	79	89				
P	65	65	72	68	69					69	65	66	77			
Q	9	82		67	63	63	59	59	60	60	63	66	57			
R	64	62	62	62							66	66	63			
S	67	67	68	68	67	67			67	67	67	67	67			
T	67	66	67	68	68					61	68	65	65			
U	55	60	59	82	63	55	54	58	68	60	50	50	52			
V	57	54	56	54	51	50			53	52	54	53	54			
Total.....	1576	1682	1641	1628	1500	1381	474	460	1399	1414	1506	1663	1547			
Arithmetic mean.....	84.2	93.4	96.5	95.8	93.8	98.6	59.3	51.5	107.6	94.3	94.1	103.9	103.1			
Dorsal																
A	50	54	60													
B	50	51	52	57	57	58	58	54	54	57	57	57	53			
C	45	44	45	47	47	49	60	55	51	48	46	44	29			
D	46	46	65	68	64	62										
G	56	63	65	65	65	65			55	60	65	53	54			
H	54	62	61	61	63	63	63	63	63	62	62	63	63			
J	437	550	560	600	580	587			567	522	522	475	465			
K	8	42	5	52	51	52	55	55	53	55	56	57	58			
L																
M	37	34	33	31	31	31	28	28	32	32	34	36	36			
N	45	37	43	50	37	36			60	57	60	60	60			
O	43	35	37	43	41	42	34	49	31	39	47	32				
P	47	50	40	40	33					39	40	34	27			
Q	34	32		38	43	48	58	51	53	59	44	32	48			
R	37	49	52	55							54	45	42			
S	53	45	40	51	59	53			53	45	53	54	57			
T	47	54	56	57	59					50	45	55	56			
U	39	43	46	13	23	33	23	43	13	13	36	48	53			
V	51	54	54	52	56	56			56	55	56	56	53			
Total.....	1179	1345	1314	1380	1312	1234	379	398	1141	1193	1277	1201	1154			
Arithmetic mean.....	65.6	74.7	77.3	81.1	82.0	88.1	47.4	49.8	87.8	79.5	79.8	75.1	76.9			

due to the fact that several of the children had a caged rat in the institute playground the year before. B, K, and C were among the group and reacted positively; but R who had the same experience still reacted negatively.

The rabbit elicited the largest num-

tive reactions than positive responses. It also elicited a high percentage of doubtful responses. The parrot was rather nervous on his perch and used his hooked beak continuously in eating grain or at biting the chain.

An analysis of the total approach, retreat, pursuit, and withdrawal reac-

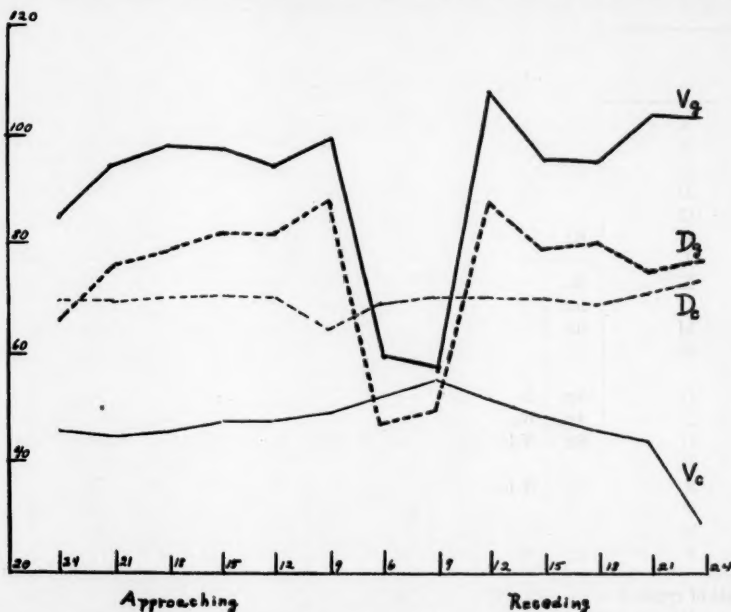


FIG. 6. VENTRAL AND DORSAL PRESSURE VARIATIONS AT DIFFERENT DISTANCES  
 $V_g$  and  $D_g$  are group curves based on averages of group scores for each interval.  $V_c$  and  $D_c$  are curves for individual C.

ber of positive reactions or 47 per cent of the total. It also occasioned the least number of doubtful reactions or 5 per cent. Reactions to this stimulus which was the largest stimulus were the most clear cut but practically equally divided as to positiveness and negativeness.

The parrot occasioned more nega-

tions shows that 36 per cent of 182 responses were positive, 43 per cent were negative and 20 per cent were doubtful. Approach was the reaction of least frequency. This might be expected since it would require a rapid decrease of distance between the already approaching objects.

But the withdrawal from the reced-

ing stimulus was only of secondary frequency, *i.e.*, 16 per cent of the cases. lack of emotional shift from the previous retreat.

This was to be expected since the children probably inferred the crisis was approaching stimulus totals 49 or 27

TABLE 4

*Reaction of child to approaching or receding stimulus*

*Ap.—Approach; Rt.—Retreat; Ps.—Pursuit; Wd.—Withdrawal;*

*Wds.—Withdrawal summation*

— no test given. . . . Doubtful responses

	SMALL FROG		WHITE RAT		LARGE FROG		RABBIT		PAROQUET	
	Coming	Going	Coming	Going	Coming	Going	Coming	Going	Coming	Going
A	Rt.	...	Rt.	Ps.	Rt.	...	Ap.	Ps.	Rt.	Wds.
B	...	Wds.	Ap.	Ps.	Rt.	Wds.	Ap.	Ps.	Rt.	Wds.
C	...	...	...	Wd.	Rt.	Ps.	Rt.	Ps.	Rt.	Wds.
D	...	...	Rt.	Ps.	Rt.	...	Rt.	Ps.	Rt.	...
G	—	—	Rt.	Wds.	Rt.	Ps.	Rt.	Ps.	Rt.	Wds.
H	Rt.	Ps.	...	...	...	Wd.	Ap.	Ps.	...	...
J	—	—	...	...	Rt.	Ps.	Rt.	Wds.	Rt.	Wds.
K	Rt.	Wds.	Ap.	Wds.	Rt.	Wds.	Rt.	Wds.	Ap.	Wds.
L	Rt.	...	—	—	—	—	...	...	...	...
M	Rt.	...	...	...	Ap.	Ps.	Ap.	Ps.	Ap.	Ps.
N	...	...	Rt.	Ps.	...	...	Rt.	Wds.	Ap.	Wd.
O	Ap.	Ps.	Ap.	Ps.	Ap.	Wd.	Rt.	Ps.	Ap.	Wd.
P	Ap.	Wd.	Ap.	Wd.	Ap.	Ps.	Rt.	Ps.	...	Ps.
Q	Rt.	Wds.	Ap.	Ps.	Rt.	Ps.	Ap.	Ps.	Ap.	Ps.
R	...	...	Rt.	Ps.	Rt.	Ps.	Rt.	Wds.	Rt.	Ps.
S	Rt.	Wds.	Rt.	Wds.	Rt.	Ps.	Rt.	Ps.	Rt.	Ps.
T	...	...	Rt.	Wds.	Rt.	Ps.	Rt.	Ps.	Rt.	Wds.
U	...	...	Ap.	Ps.	Ap.	Ps.	Rt.	Wds.	Ap.	Ps.
V	Rt.	Ps.	Rt.	Ps.	Rt.	Wds.	Ap.	Wd.	Ap.	Ps.
Totals of types of reactions:										
Approach.....	2	0	6	0	4	0	6	0	6	0
Retreat.....	8	0	8	0	12	0	12	0	9	0
Pursuit.....	0	3	0	9	0	10	0	12	0	8
Withdrawal.....	0	1	0	2	0	2	0	1	0	1
Withdrawal summation....	0	4	0	4	0	3	0	5	0	7
Doubtful.....	7	9	4	3	2	3	1	1	3	3

over. This reaction in most cases is due to summation of a negative reaction or fatigue which keeps the child resting in a relaxed condition on the dorsal cushion. It may also show a

per cent of all cases. It occurred twice as often as approach in every case except with the paroquet.

The remarkable fact is that "pursuit" had such a great frequency while

its positive counterpart in this test, "approach" had the smallest. For this group when a stimulus is going away, pursuit is the mode of reacting to it, although retreat may have been the previous reaction-pattern.

TABLE 5  
*Individual reactions*

	COMING ANIMAL		GOING ANIMAL		DOUBTFUL
	Approach	Retreat	Pursuit	Withdrawal	
Older children					
A	1	4	2	1	2
B	1	2	2	2	2
C		3	2	2	3
D		3	2		5
E		4	2	2	
H	2	1	2	2	3
J	1	2	2	1	2
K	1	3	1	4	1
L		1		1	5
M	3	1	2	1	3
N		2	2	1	5
Total.....	10	26	19	10	31
Younger					
O	4	1	4	1	
P	3	2	3	2	
Q		4	3	4	1
R		4	2	2	2
S		5	2	3	
T		4	2	2	2
U	3	1	3	1	2
V	2	3	3	1	2
Total.....	14	23	23	14	6
Grand total..	24	49	42	30	37

Table 5 shows that the younger group excelled the older in definitive reaction patterns. The younger children tend to make clear cut reactions.

Besides the concomitant variation of body position in regard to stimulus movements which shows the stimulus movement is a real causal factor in emotional behavior we have the corroborative testimony of the verbal report of the children. No formal questions were asked and speech was not encouraged, yet 120 verbal reports expressing the idea of distance were recorded. Some children made no verbal expressions, others made several in one test. However such that were made indicated consciousness of space factors. Usually when the object was far away the word was "Move it over to me," "Move it out," Then "have more," "a tiny bit more," "Push it some more." As the object moved closer the expressions were "That's enough" or "Enough," "Please don't," "I don't want it near." "Push it back," "Pull it away," all of which shows an explicit awareness of the space factor in the emotional situation. Some children protested "That's enough" at the 21 inch distance, others did not do so until the stimulus approached to within a few inches.

*Head and hand movements.* In cases where positive body movements were recorded the head was usually moved forward and the hands rested in front of the body on the tray of the chair or on the floor of the stage or were in contact with the stimulus object usually with intermittent withdrawals.

But where dorsal compression and negative report occurred the head was drawn back and the hands were fisted and held on the chest, or flat back on the shoulders or even back and hanging down behind the arm rests. In about an equal number of cases, the

fingers of one or both hands were put in the mouth, while a few pulled on their ears and hair. This last behavior was especially true of R and S.

*Summary of results.* Analysis of the data show that concomitant variations in ventral and dorsal pressure or consistency in responses toward approaching or receding stimuli are found in 79 per cent of the cases. Lateral concomitance is found in only 2.2 per cent of the cases. The movements to either side appear to be of little importance in response to stimuli moving forward and backward before a child restricted in a chair.

Concomitant variation or consistency in response does not show the types of response. In some cases there was withdrawal from both approaching and receding stimuli; in others withdrawal from the approaching and pursuit of the receding animal. The distance of the animal from the child was also a factor as some children consistently approached an animal coming toward them up to a certain point and then withdrew; in other cases the child failed to begin pursuit of a receding animal until he was at a distance from him. The most frequent reactions were withdrawal from the approaching animal and pursuit of the receding animal.

Reactions varied to different animals. Familiarity with the animal appears to be influential and also size of the animal. The white rat and the rabbit with which some children were familiar elicited a greater number of approach responses to the coming animal than did the other stimuli. These larger animals also elicited a greater number of retreats.

As the series progressed averted behavior was less violent and approach reactions were freer. This would indicate reduction of emotion with successive presentations. Verbal reports tend to corroborate the findings from pressure variations.

It is already shown that not only movement of stimuli but the direction of movement relative to the position of the child is a factor of importance in the emotional behavior of the child. The number and types of movements of the child in relation to the movements of the stimulus object appear to indicate the degree of emotion aroused in the child.

#### MATERIALS AND STIMULI FOR STANDING TEST

In this test the major objective was the freedom of the child in approach toward or retreat from animals. An oil cloth rug 8 feet square having 4 concentric circles 1 foot apart or varying in diameter by 2 feet was placed upon the floor. A small table about 18 inches square and 18 inches high was placed in the center of the innermost circle and the stimulus object fixed upon the table as illustrated in figure 7. The stimulus objects were 3 young chicks less than three weeks old, 3 large frogs weighing two thirds of a pound each, 1 rabbit weighing about 4 pounds. These objects were placed upon the table, one kind of animal at a time, covered by a cloth of one of three bright colors. The chicks and frogs were contained in a glass dish three inches high and surrounded with a wire cage 8 inches high but open at the top. Quarter inch mesh afforded clear visibility of the object which was



illuminated from above when the cloth was removed. In the case of the rabbit a wire cage was inverted over him and the cloth draped upon the cage. On exposure of the rabbit the cloth and cage were lifted off.

*Procedure in standing test*

The children were brought into the room singly, where one draped object

are to stand still, until I pull the cloth off the thing that is on the table. Then you can walk about and do anything you please to it." Moving to the table, stop-watch in one hand, he asks, "Now are you ready?" When the subject says "yes," the cloth is drawn off the object and placed upon a table about five feet from the stimulus object.

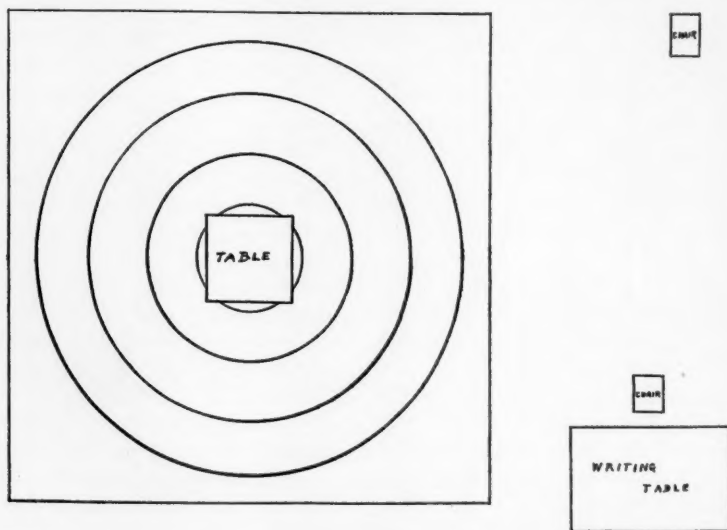


FIG. 7. ILLUSTRATION OF SITUATION IN STANDING TEST

was already on the table. The experimenter stood by the child at the circumference of the outermost circle, and facing the table, gave the following direction: "This is a game. It is your part of the game to stand on this line at the start, but you can walk about as soon as I say 'Go.' I am going to show you something, which is on the table under the cloth, but you

Records were made of time when the child moved off the spot, whether he moved forward or backward, of time and distance of later movements, and of what he did with the objects. In case the child asked questions such as "Can I touch him?" he was answered "Yes." In case the child did not act spontaneously he was engaged in a conversation as to "What

is it?" "What would you like to do with it?" "Would you like to have it, or take it home?"

The time limit, in the case of children of slow or blocked reactions, was any length of time as long as the child coöperated or was interested. In case of a flat refusal it was five minutes. In case of a child picking up or carrying the stimulus object about, the test was terminated there.

Two presentations of each stimulus were made in the following order: chicks and frogs the first day, frogs and rabbit the second day, and rabbit and chicks the last day. The objects were presented in their proper cage in the order listed. The second object was brought to the table from behind a screen after the first object had been removed from sight. During this interval the child sat on a chair which was convenient during the whole test and the child could sit down at any time.

A preliminary or introductory test was given to the children in groups of five with the same apparatus. The stimulus object consisted of two stuffed ducklings. The children stood about in a circle. These group reactions were a bit quicker than in the subsequent solitary tests but still guarded, prefaced by "What are they?" Usually three or four approached the object without urging. In this introduction those who did not move spontaneously were urged to do so, to "touch it in turn." The children were also permitted to play games on the oil-cloth in order to reduce the novelty of the circles. Only two children remarked on the circular lines.

*Results of the standing test.* The

findings of this test are considered from three aspects: the most positive-reactions, the first negative reaction, the verbal report with either positive or negative reactions.

*Positive reactions.* The most positive reaction was considered to consist of a time factor, the time at which the reaction occurred, and spatial and activity factors of where and what was done. These factors were put into five groups on a frequency basis as given in table 6. The reaction was the nearest position or activity at its earliest appearance after exposure of the stimulus.

The most frequent reaction to the chicks was "touching them" or "picking them up," without much improvement in the second trial over the first. Picking up was more frequent on second trial. With the frogs the tendency was to stand alongside, to lean on the table or touch the cage and to touch the frogs. No one tried to pet them, only one tried to pick them up. To the rabbit the reaction was primarily touching and petting or stroking. Three attempts were made to lift him up. Petting increased with the second exposure.

The data given in table 7 show the form of reaction and the time at which the most positive reaction was made. For the chicks the second trial showed a wider range in time before positive reaction and a higher mean time. For the other animals second trials showed a decrease in range and mean. Analysis of the forms of reaction shows that 85 per cent of the responses are contacts with the animals or reaching toward them. These responses are much less frequent to frogs than

to the chicks or rabbits. Certain animals appear to provoke more caution in approach than others. The two cases of picking up the frog were responses of the same child and the tions were reactions made when the subject moved body away from the stimulus. The hand movements away from the objects after single or successive touches or strokes are not included

TABLE 6

*Most positive reactions and time of occurrence*

Sa = alongside, Re = reach for, lean over, shake table, Th = touch, Pk. = petting or picking up. S with a numeral indicates standing at that distance from center as S3 standing 3 feet from the center. In the case of 5 it may mean sitting down or leaning against the wall.

REACTOR	CHICKS				FROGS				RABBITS			
	First trial		Second trial		First trial		Second trial		First trial		Second trial	
	Reaction	Second	Reaction	Second	Reaction	Second	Reaction	Second	Reaction	Second	Reaction	Second
W-	S2	165	Pk	25	Th	360	Re	60	S2	105	Pk	180
S	Pk	150	S3	27	Sa	240	S6	180	Sa	315	S5	310
R	S2½	240	Sa	10	S2	180	Sa	90	S5	420	S6	360
U	Th	12	Th	10	Th	12	Th	10	S2½	135	Th	15
F	Th	255	Th	120	Th	165	Re	255	Th	7	Pk	10
B	Th	25	Pk	90	Th	340	Th	60	Pk	90	Pk	50
C	Th	15	Pk	180	S1	70	Sa	10	Pk	150	Th	20
N	Th	12	Pk	60	Th	15	Th	120	Th	15	Pk	15
O	Pk	55	Pk	65	Th	140	Th	15	Pk	140	Th	25
T	Pk	35	Pk	5	Pk	15	Pk	60	Pk	40	Pk	10
V	Pk	40	Pk	10	Re	15	Sa	25	Th	180	Pk	10
A	Pk	20	Pk	35	Th	45	Th	20	Th	375	Pk	135
M	Th	35	Th	150	Sa	63	Sa	5	Pk	45	Pk	30
E	S2½	150	Th	30	S2	10	S2	105	S3	285	S3	120
H	Th	45	Pk	25	S1	10	Th	20	Pk	120	Pk	40
L	Pk	25	Pk	10	Sa	5	Sa	150	Pk	95	Th	12
K	Pk	120	Pk	20	Sa	7	S2	20	Pk	15	Pk	5
Q	Pk	35	Th	30	Sa	5	Sa	10	Th	360	Pk	100
P	S1	7	Th	25	Sa	5	Sa	5	Pk	180	Sa	120
D	Pk	15	Pk	20	Th	15	Th	90	Pk	50	Pk	15
Range of time.....	7-255		10-275		5-360		5-255		7-420		5-360	
Mean time...	72.8		47.3		85.8		65.5		156.1		79.1	

same group of children were responsible for the touching response for the small and the big frog. Familiarity with the animal is a prominent factor in the response.

*Negative reactions.* Negative reac-

although they occurred frequently, too frequently to be recorded with accuracy.

The negative reactions must be divided on the basis of the stimulus as being quiet and as being active or

moving, hopping or flying. On this basis of comparison the negative reactions may be divided as follows:

STIMULUS	NUMBER OF RETREATING REACTIONS	
	quiet	moving
Rabbit.....	15	4
Frogs.....	19	15
Chicks.....	10	3

It must be noted that the rabbit moved his head about at every trial and likewise the frogs climbed or tugged at a 10-inch leash in every case. When the chicks began to fly out

It may be said that there is a limit to tolerance of the stimulus perhaps due to fatigue or summation of negative factors. The test was cut off in those cases and when the child picked up the animals. In the latter case there was no possibility for fatigue or negative summation. Table 8 illustrates the relative frequency and distances to which the children withdrew from the stimuli. The frogs caused more negative reactions than the other two stimuli combined and also occasioned the most distant withdrawals.

TABLE 7  
*Frequency of reaction types*

TYPES OF REACTIONS	TO CHICKS	TO FROGS	TO RABBIT	TOTAL
Picking up.....	21	2	22	45
Touching.....	13	15	9	37
Reaching.....	0	3	0	3
Standing alongside..	1	13	2	16
At 1 foot.....	1	2	0	3
At 2 feet.....	3	4	2	9
At 3 feet.....	1	0	2	3
At 4 feet.....	0	0	0	0
At 5 feet.....	0	0	2	2

younger ones were substituted, but the chicks pecked and moved about in the cage incessantly. Moving includes on the part of the stimuli hopping, climbing, scratching the board by the rabbit and flying. The negative reactions occurred when the animals jumped, scratched or flew. In these cases the reaction was immediate and uniformly so as far as could be observed. Other reasons for withdrawal were to speak to experimenter, to sit in a chair, to look out the window, to get the covering cloth to cover animals, "to get a stick."

TABLE 8  
*Frequency of negative reactions at varying distances*

DISTANCE AT	RABBIT	FROGS	CHICKS	TOTAL
1 foot.....	0	1	0	1
2 feet.....	2	1	0	3
3 feet.....	7	7	2	16
4 feet.....	0	7	2	9
5 feet.....	5	6	5	16
6 feet.....	2	2	0	4
Experimenter.....	2	8	2	12
8 feet.....	0	0	1	1
Total.....	18	32	12	62

On the probability that animal movements occurred as frequently with the older as with the younger children it appears that the younger made more negative reactions than the older. Among the older children 8 were negative to the frog, 6 to the rabbit and 3 to the chicks, 1 to none of them. Among the younger, 10 were negative to the frog, 7 to the rabbit, 7 to the chicks.

*Verbal report.* Language expression was of two kinds, spontaneous and requested. The requested was in re-

sponse to the following queries: "Would you like to touch, (play with or see) it?" "Would you like to have (or be given) it?" "Would you like to take it home?" Answers of "Yes" or an affirmative headshake are considered a positive answer; "No," or a negative headshake are considered a negative answer. Spontaneous report is expression arising freely from the child without intervention or in reply to "What do you think about it?"

Spontaneous reports included cases of the following: "I'm afraid," "I like," "I wish I had," "He's good, I'd like to take home," "He's all right," "Pretty," "I don't like those," "I don't know," "Let's kiss 'em," "I wouldn't take 'em." There were 30 such spontaneous expressions.

The verbal report was considered in relation to the position of the child at the time. Obvious cases of doubtful expression occur. Similarly the problem of where to mark near and far is not easy to solve. The writer has considered near to mean alongside and within one foot away from the animal which is within easy reaching distance. The responses are summarized as follows:

	CHICKS	FROGS	RABBIT	TOTAL
Positive near. . . . .	24	7	19	50
Negative near. . . . .	1	8	1	10
Positive far. . . . .	0	0	0	0
Negative far. . . . .	8	18	8	34
Doubtful cases. . . . .				6

As is evident above 50 per cent of the reactions consisted of positive expressions while near the stimulus and 34 per cent of the reactions consisted

of negative expressions while relatively far from the stimulus. This gives 84 per cent of the cases in which bodily proximity concomitantly accompanies positive tendencies or attitudes and bodily distance accompanies negative tendencies or attitudes. Of special significance is the absence of any affirmative expression coincident with a distant position. Of the 10 cases which disagree with the general findings 8 of these pertain to frog stimuli which are complicated by wetness and odor.

A summary of the results for the condition of freedom of movement by the child toward or away from animals that are restricted in space shows that 85 per cent of the responses are approach, including reaching toward, touching, and picking up the animal. These responses vary in frequency for different animals. These variations appear to be due in part to the size of the animal and to the amount of activity of the animal. Verbal reports also show that the approach reactions are accompanied by expressions of desire for possession and withdrawal reactions are accompanied by expressions that indicate a desire to avoid nearness or contact with the animal.

Though the negative reactions are much less frequent under conditions of freedom of movement there are individual differences among children in the degree of emotion manifested. The spatial factor of distance from the stimulus correlates closely with the type of reaction made though in a few cases the movements of the animal cause withdrawal reactions after contact has been made.

## GENERAL CONCLUSIONS

In a study of spatial factors as influential upon emotional responses two situations were presented. In one the child was restricted and five animals, used as stimuli were moved toward or away from the child. In the other situation, the child was free to move and the animal was restricted in space. Seeking or approach responses occurred much more frequently when freedom of movement was permitted the child.

Analysis of results for consistency in types of movements under conditions of the first situation shows a high percentage of concomitant variation in forward and backward movements to approaching or receding stimuli. The most frequent relation found was withdrawal from a coming animal and pursuit of the animal going away.

The shifting in reactions of children to the changing movements of the animal shows that not only movements but direction of movements in relation to the position of the child are influential upon these reactions. An approach toward the animal seemingly a manifestation of curiosity often changes to withdrawal as the animal comes close to the child. As the animal moves away sustained withdrawal often changes to an approach.

In both situations different animals elicited different reactions. Size and activity of the animal, familiarity, and distance from the child were influencing factors. In a state of freedom of the child to move as he desired contacts with the animal, near contacts such as reaching toward it, and approaches to nearer positions were

more frequent for all animals than under restriction of movement of the child.

With restriction of movement of the child the forward and backward movements as measured by the ventral and dorsal pressure variations show greater responsiveness of an emotional type than less controlled observations would indicate. Restriction of the child in space often occasions emotion. With the addition of an approaching animal we have behavior that indicates varying degrees of emotion. Verbal expressions reinforce the conclusion that concomitant variations in the responses to moving stimuli offer a valuable method of study of emotion in children.

The modification of responses with successive presentations may show adjustment to the experimental conditions. The decrease in avoidance reactions and in speed or violence of such reactions as indicated by the pressure variations leads to the conclusion that there is a reduction in the emotion aroused. The avoidance reactions that are usually assumed to indicate fear are modified and the seeking reactions are more frequent, and more pronounced. This would indicate a modification from one form of emotional behavior into another.

There are marked individual differences among children in the responses made in both experimental situations. Some do not progress beyond a retreat response though the extent or degree of avoidance is decreased. Others progress rapidly from withdrawal to approaching reactions and attempts at possession. The pressure variation



method showed lack of concomitance with excessive movement indicating a state of incoördination for some individuals. In other cases the response was primarily a rigid posture, and the records give no indication of the reaction tendency. Verbal reports and similar responses in the other test with freedom of movement indicate that these posture reactions show negative or withdrawal tendencies.

A practical implication of this study is that the adjustment of a child to situations that provoke undue emotion is best made under conditions in which he has freedom in response except for the continued presence of the stimulus that arouses emotion. With successive presentations it may be expected that the emotion will be reduced and the behavior will be modified into more desirable forms.

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# A Brief Report of the Responses of Preschool Children to Commercially Available Pictorial Materials

ELIZABETH E. OLNEY AND HAZEL M. CUSHING

MANY statements have been made in the literature concerning the characteristics of pictures which hold an appeal for children of the preschool levels. Illustrations of familiar objects, of the child's everyday experiences, of animals, other children, automobiles, boats, trains, and airplanes; pictures simple in design, clear in outline; pictures containing color and action; pictures with little detail and little or no background, are among those cited as of especial interest to young children.

In the study here reported the attempt was made to investigate the reactions of 36 nursery school children to different types of pictures frequently found in books for young children. No effort was made to control all the characteristics of the materials presented. The stimulus quality of the latter was rather of the 'gestalt' variety which is identical with the everyday experiences of the child.

Sixteen sets of pictures, culled from a wide selection of children's picture books, were so arranged that each set contained four pictures of similar size, content, and treatment. Nine of the sets were colored and seven were uncolored. The materials were

uniformly mounted on stiff gray cards and presented in 4 parallel series, a, b, c, d, each series containing one picture from each set, or 16 pictures. The 4 series were presented at intervals of from five to eight days in order to cancel any loss of interest through recency of presentation. The order of presentation was rotated with each subject in order to eliminate the effect of loss of interest through fatigue.

The reliability of the material, ascertained by correlating series a and b against series c and d, was found to be  $.62 \pm .07$  which was raised to .77 by application of the Spearman-Brown prophecy formula.

The following is a description of the sets:<sup>1</sup>

1. A set of toys (colored) (simple outline, no background).
  - automobile
  - train
  - doll
  - aeroplane
7. An identical set of toys (uncolored).
8. A set representing animal activities (colored, simple outline).
  - rabbits eating
  - dog and cats drinking milk
  - pigs eating
  - dogs looking into a mirror

<sup>1</sup> Numbers refer to the order of presentation in the series.

2. An identical set representing animal activities (uncolored).
3. A set of silhouettes with a rather fantastic treatment (colored<sup>2</sup>).
  - sailboat
  - elfin blowing a horn
  - children at the beach
  - elfins at play
11. An identical set of silhouettes in black and white.
12. A set of complex compositions (colored, rather sophisticated treatment).
  - children getting dressed
  - children saying their prayers by the bed
  - children swinging
  - children eating their supper
13. A set of mechanical subjects plus the human element (colored, considerable background).
  - people starting off for an airplane ride
  - people in a boat
  - men and engine in the roundhouse
  - people starting off in an automobile
14. A set of photographs of everyday objects from a well-known picture book (uncolored).
  - cup of milk and plate of buttered bread
  - chair with a doll beside it
  - wash bowl with soap, glass and toothbrush on it
  - blocks
9. A set of photographs of the objects in the above set with a human element introduced into the situation
  - girl drinking milk
  - girl sitting in chair holding a doll
  - boy washing his hands
  - girl playing with blocks
15. A set representing child activities (colored, very little background).
  - boy riding a velocipede
  - boy riding a cart
  - boy playing with a ball
  - boy building with blocks
5. An identical set representing child activities (uncolored).
10. A set of small animals (colored, no background).
  - cow
  - horse
  - sheep
  - dog
16. An identical set of small animals (uncolored).
4. A set of large animals (colored, very little background).
  - cow
  - horse
  - sheep
  - dog
6. A set of mechanical vehicles (colored, practically no background).
  - automobile
  - aeroplane
  - steamship
  - train

After considering various possible criteria of interest reported in several somewhat similar studies it was decided to use the objective measure of length of time spent in looking at each picture as the measure of a child's interest. A stop watch, kept concealed by the experimenter, was used for this purpose. A criterion for cessation of interest was empirically determined.

Of the 36 children who served as subjects 12 were on the four year level, 22 on the three year level, and only 2 of the group were between two and three years of age.

The sets with the three highest time scores for the group as a whole were set 13, mechanical subjects involving people, set 12, dramatic scenes with children, and set 6, mechanical subjects without the human element. Set 9, photographs of children with everyday objects, and set 15, child activities done with rather simple outline, were next in popularity in terms of the criterion. Sets receiving the lowest

<sup>2</sup> The background is colored.

times scores were sets 16, small uncolored animals, set 11, silhouettes in black and white, set 2, uncolored animal activities, set 10, small animals colored. Set 3, silhouettes with colored background, set 8, representing animals activities, and set 4, large animals, also ranked low in interest value as judged by the criterion.

An analysis of results according to age level showed no significant differences on the 2, 3, and 4 year levels. Sets which elicited the prolonged attention of the four year olds were also most potent in producing a lengthened time score for the two and three year olds. Likewise, the sets obtaining lowest scores were practically the same for all these age levels.

Although sex differences in score were not large there was an observable tendency for boys to show a marked preference for pictures involving mechanical objects such as trains, boats, aeroplanes, automobiles, while the first choice of the girls seemed to center around scenes with a strong dramatic element.

In spite of the fact that the number of cases involved in the study was not large (36), certain trends stand forth rather clearly with the particular group of children concerned.

Mechanical objects had a high interest value in terms of the criterion. The introduction of the human element whether of adults or children enhanced the value of all types of pictures. Animals, whether portrayed individually or in groups came surprisingly low on the scale. Whether this preference in the direction of the mechanical would obtain with children in a rural type of environ-

ment has not been determined. If it is, to a certain extent, true that one's preferences are genetic in origin, i.e., that we tend to like that to which we become accustomed, it is possible that interest in animal life might be dominant in a non-urban group of children. This assumption cannot be made, however, without further experimental evidence.

In checking picture books found in the homes of the children who served as subjects in this study, it was found that over three quarters owned animal books, while but one quarter had access to pictures of mechanical objects and that fewer still had pictures involving children and everyday objects and experiences. Books of all these various types, however, were available to the children in the nursery school environment. It would seem in the light of these findings that possibly adults should reverse their procedures in selecting picture books for children at least in urban communities, and provide the mechanical and dramatic pictures, as well as those of animals.

Complexity of detail and even fantastic treatment did not seem to be a bar to interest, providing the picture had inherent dramatic quality. Background or lack of background did not seem to be a determining factor in the amount of time spent in looking at a picture even with the youngest children.

When 5 colored sets were compared with their 5 uncolored counterparts, it was found that color enhanced the interest value of the pictures to a considerable degree.

Silhouettes, despite their artistic merit, at least for the child of nursery

school age, would seem to have less attention value than other types of treatment.

Comparing scores for large and small animals it was found that the former are more potent from the child's point of view.

The differences reported above were found to be reliable when sample pairs were tested statistically by the formula for determining the reliability of differences.

In the light of these tentative conclusions, the value of any picture book for the young child should not be minimized. Many books are partic-

ularly valuable as incentives to the development of vocabulary, where the adult points out the object and gives the appropriate word. It is probable, however, that a desirable procedure would be that in which first hand experiences preceded the introduction of pictures built around those experiences and that as the activities of the child expand in scope, new pictorial material might well be introduced which would serve to recall and vivify the experience. Actually such does not seem to be the common practise either at home or in school.

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# The Effect on Behavior of Variation in the Amount of Play Equipment<sup>1</sup>

MARGUERITE WILKER JOHNSON

CONSIDERABLE information on childhood play is now available. Investigations have afforded data as to types of occupations in which children engage, kinds of play materials used, time spent in different activities, types of social participation and sex and age differences. More than a hundred such studies have recently been classified by Hurlock (3).

Similar tendencies in play behavior have been noted in situations that are somewhat alike. Few direct comparisons, however, have as yet been attempted with experimental variations in play equipment in the same or comparable groups of subjects. There is need for more specific information as to the advantages and disadvantages of different types of play situations. Are children, for example,

more active, more resourceful, and more sociable on generously or on meagerly equipped playgrounds? How does play behavior vary when the same playground is variously equipped? These questions have prompted the present study.

The problem was to compare the activities of the same children on the same playground before and after a change occurred in the play equipment. Three separate studies have been made on three different playgrounds. Two surveys of the same group of children were made on each of these three playgrounds, once before and once after a variation occurred in the play equipment.

One group of children was accustomed to considerable equipment. This group was observed at regular play and again after considerable play equipment had been removed. The other two groups were accustomed to much less equipment. Each of these groups was observed at regular play and again after considerable new play equipment had been introduced. The report for each group will be presented separately and the general implications will then be considered (4).

<sup>1</sup> From the child development laboratories of the University Elementary School of the University of Michigan. The observers were: For the three-year-olds, Mrs. Samantha Cleminshaw; for the four-year-olds, Miss Mary Louise Hohn; for the five-year-olds, Miss Kathryn Purcell. The writer is indebted to Mrs. Minnie Arnold, principal of the schools, who made the observations in public schools. Some of the data are summarized in her unpublished M.A. thesis (1).



# I. THE EFFECT OF A REDUCTION IN PLAY EQUIPMENT ON THE BEHAVIOR OF THE CHILDREN ON THE UNIVERSITY ELEMENTARY SCHOOL PLAYGROUND

Two series of observations of the play activities of the same children were made on the University Elementary School playground to discover the effect of the removal of considerable play equipment on the play behavior of the children. The general principles developed in time-sampling studies were employed in the initial and final observations (5). Each series consisted of 21 observations for each child, one made in each five-minute unit of time and seven made on each of three days. The detailed instructions for observing and recording were as follows:

"Begin at 9:30 o'clock, Monday, April 24, 1933. Look at the first child on the list. Take time to decide what he is doing. Pay no attention to any other child. Record a symbol opposite the name to show what he is doing. If he is playing with others, use a figure to note the number of his companions. Proceed to the next child and do the same, and continue down the list. Then rest until the end of that five-minute period."

"Begin again on the second five-minute interval at the top of the list and go down the list in the same way. Continue for seven periods of five minutes each, a total of 35 minutes each day."

"Repeat on Tuesday, April 25, and again on Wednesday, April 26."

"While recording take an advantageous position and keep it throughout, except when it is necessary for you to move to locate a child."

The first survey was made on the first three days of the week. The experimental materials were then removed during the week-end and the

second survey was made on the first three days of the following week. In addition to the eye-witness surveys the playground was photographed every five minutes. The results of the photographic work are to be published in a separate paper (6).

The regular playground was equipped with two stationary slides, one medium and one small, one baby junglegym, two swings, one large sand pit with sand toys, one stair climbing apparatus with platform, one movable slide three feet wide and three feet long, one rocking boat, a half dozen tricycles, six kiddy cars, ten Buddy L trucks, six wagons, five wheel barrows, one set of Rathbun out-door building blocks, two large dry goods boxes, four saw horses, six planks, four kegs, six shovels, seven rakes, four spades and six balls of various sizes. After the first survey was made all equipment and materials, except the two stationary slides, two swings, stair climbing apparatus, junglegym and sand pit were removed from the playground. For convenience the articles that were withdrawn will be referred to as the experimental materials.

The report is based upon observations of 33 children, 18 boys and 15 girls who were enrolled in three age groups as shown in table 1. One of the two regular teachers for each group was in charge of the children while the other teacher was engaged in making the observations. The children were accustomed to this type of situation since one teacher was always free in regular practice to give any needed assistance while the other teacher was engaged in routine work.

TABLE I  
Outline for three studies of the effects of variation in play equipment on the behavior of children

STUDY	SUBJECTS	INITIAL OBSERVATIONS	EXPERIMENTAL VARIABLES	FINAL OBSERVATIONS	COMPARISONS
I. University Elementary School Playground, April, 1933	Age, September 1, 1932 Mos. 36 48 60 T B 5 8 5 18 G 2 7 6 15 T 7 15 11 33	(1) 21 records per child (one record for each child in each 5-minute period for 7 periods on each of 3 days). Code recording of activities (2) 7 photographs of playground each 5-minute period	Removal of Equipment 1 Movable Slide 1 Basket of Sand Toys 1 Rocking Boat 33 Vehicles 6 Shovels, 7 Rakes, 4 Spades 6 Balls 1 Set Rathbun Blocks 2 Dry Goods Boxes 6 Planks 4 Kegs 4 Saw Horses	Duplicate of initial observations	Amounts and types of activities before and after the removal of equipment. Sex differences. Age differences
II. Public School A Playground, Jackson, Mich., May, 1932	Average age, September 1, 1931 Months $60 \pm 4.7$ B 24 G 22 T 46	(1) 12 records per child (one record each 5-minute period for 3 periods on each of 4 days). Code recording of activities	Introduction of Equipment Building Blocks 2 Boxes 2 ft. x 5 ft. 2 Boards 5 ft. long 2 Wooden Horses 1 Barrel 7 Wooden Wheels 4 Iron Rods	Duplicate of initial observations	Amounts and types of activities before and after the introduction of equipment. Sex differences. Age differences
III. Public School B Playground, Jackson, Mich., April, 1933	Average age, September 1, 1931 Months $63 \pm 2.0$ B 15 G 14 T 29	(1) The same as for Public School A	Introduction of Equipment (as above) Boxes Boards Barrel Wheels and Rods	Duplicate of initial observations	Same as above
Total.....	B 57 G 51 T 108	45 units of observations		45 observations	

The specific activity records have been classified in broader categories as needed for the exposition of the experimental variations and the trends of evidence. The larger categories for classification are as follows, bodily exercise, play with materials, undesirable behavior, games and contacts with the teachers. Bodily exercise includes vigorous gross motor activity such as swinging, running, sliding, climbing and jumping and less vigorous activities such as talking, shouting, walking, sitting, standing, looking and listening. Play with materials has been subdivided into play with permanent material (manipulation of sand and dirt), and play with experimental materials (the use of vehicles, shovels, rocking boat, balls and building materials). The categories, their symbols and the results are shown in table 2. The statistical treatment is in terms of the number and per cent of the total child-observations which fell in each category.

The trends found for the larger categories appear to be significant. The number of children and the observation involved, however, are not sufficient to establish with certainty the reliability of the trends found for the specific items. A correlation (Spearman Rank Difference) of .77 (converted  $r .78 \pm .06$ ) represents the agreement between the relative frequencies of activities on the playground before and the activities on the playground after the removal of play materials when those items occurring in only one situation are excluded. It will be seen that in spite of quantitative variation in the amount of certain activities the rela-

tive proportions remain somewhat constant.

Even though the same general tendencies are noted in both the regular and the reduced situations some important differences in behavior appear. Bodily exercise is decreased in amount (table 2) from  $61.2 \pm 1.8$  per cent of all activities before to  $49.7 \pm 1.8$  per cent of all activities after the removal of play equipment, a significant decrease of  $11.5 \pm 2.4$  per cent. The decrease occurs chiefly in connection with vigorous exercise ( $8.7 \pm 3.0$  per cent) while the less active types of exercise such as walking, talking, sitting, standing appear to be about the same in amount both before and after the removal of play materials.

The decrease in the amount of bodily exercise would be much greater if those items classified under experimental materials were classified instead under bodily exercise as they represent considerable activity. Since, however, the general trends are the same in either classification, the items dealing with the experimental materials are reported here under the separate category.

Play with materials is increased after the removal of the experimental materials from  $34.9 \pm 2.0$  per cent to  $39.5 \pm 1.9$  per cent of all activities. This increase of  $4.6 \pm 2.8$  per cent in total amount is not statistically significant but the change in the nature of play in the two situations is of importance. Play with vehicles, shovels, balls, rocking boat and building materials comprise  $27.3 \pm 2.1$  per cent of all activities before and none of the activity after the materials are with-

TABLE 2  
*Play activities before and after a reduction in play equipment*  
 Number of girls 15, boys 18

ACTIVITIES	SYMBOL	NUMBER OF OCCURRENCES						PER CENT		D	D/PE <sub>d</sub>
		Before		After		Total		Before	After		
		Boys	Girls	Boys	Girls	Before	After				
<i>Bodily exercise:</i>											
<i>Vigorous:</i>											
Swing.....	Sw	26*	50	27	45	76	72	11.0	10.4		
Run.....	R	24	17	21	16	41	37	5.9	5.3		
Slide.....	Sl	20	13	22	5	33	27	4.8	3.9		
Climb.....	C	37	21	14	7	58	21	8.4	3.0		
Junglegym.....	G	17	9	9	4	26	13	3.8	1.9		
Jump.....	J		2	6	1	2	7	0.3	1.0		
<i>Less active:</i>											
Walk.....	W	12	21	16	7	33	23	4.8	3.3		
Talk.....	T	21	21	28	23	42	51	6.1	7.4		
Sit.....	S	14	15	14	33	29	47	4.2	6.8		
Stand.....	St	22	28	7	17	50	24	7.2	3.5		
Look.....	L	17	9	12	5	26	17	3.7	2.5		
Shout.....	Sh	2	5	3	2	7	5	1.0	0.7		
Listen.....	Li		1	1		1	1	0.1	0.1		
Total vigorous.....		124	112	99	78	236	177	34.2	25.5	8.7 ±3.0	2.6
Total less active.....		88	100	81	87	188	168	27.1	24.2	2.9 ±3.0	0.9
Total exercise.....		212	212	180	165	424	345	61.2	49.7	11.5 ±2.4	4.7
<i>Play with materials:</i>											
<i>Permanent:</i>											
Sand.....	Sa	20	29	87	86	49	173	7.1	24.9		
Dirt.....	D	4		74	27	4	101	0.6	14.6		
<i>Experimental:</i>											
Vehicles.....	V	85	47			132		19.0			
Shovels.....	Sh	30	1			31		4.5			
Balls.....	Ba	11	4			15		2.2			
Rocking boat.....	Ro	3	5			8		1.2			
Building materials.....	B	1	2			3		0.4			
Total permanent.....		24	29	161	113	53	274	7.7	39.5	31.8 ±3.1	10.3
Total experimental.....		130	59			189		27.3		27.3 ±2.1	13.0
Total materials.....		154	88	161	113	242	274	34.9	39.5	4.6 ±2.8	1.6

\* One item represents one record in one five-minute interval of time, 26 represents the number of items of swinging in a total of 378 records for boys.

TABLE 2—*Concluded*

ACTIVITIES	SYMBOL	NUMBER OF OCCURRENCES						PER CENT		D	D/PE <sub>d</sub>
		Before		After		Total					
		Boys	Girls	Boys	Girls	Before	After	Before	After		
<i>Undesirable behavior:</i>											
Tease.....	Ts	3		7	2	3	9	0.4	1.3		
Cry.....	Cr	1	2	5	3	3	8	0.4	1.2		
Quarrel.....	Q			3	1	0	4		0.6		
Hit.....	H	1		2		1	2	0.1	0.3		
Total undesirable.....		5	2	17	6	7	23	0.9	3.4	2.5	
Games.....	Ga			6	21	0	27		3.9	3.9	
Teacher contacts.....	TC	1	2	5	3	3	8	0.4	1.2	0.8	
Temporary absence.....	A	6	11	9	7	17	16	2.5	2.3	0.2	
Total child observations†...		378	315	378	315	693	693	99.9	99.9		

† The number of children in a sample multiplied by number of observations of each child.

drawn. Play with sound and dirt (permanent materials) amounts to  $7.7 \pm 2.4$  per cent of all occupations before and  $39.5 \pm 1.9$  per cent after the reduction in play materials, a significant increase of  $31.8 \pm 3.1$  per cent.

Games are not present in the well-equipped situation and undesirable behavior constitutes but one per cent of all activity. Games, however, are in evidence on the reduced playground and comprise 3.9 per cent of the records with undesirable behavior showing an increase of 2.5 per cent. The total number of contacts with the teacher are few and they are increased after the materials are removed. The temporary absences both before and after amount to 2 per cent of the records.

Even though the amount of undesirable behavior is relatively small in quantity as compared with other activities it may, nevertheless, be very

significant and is therefore presented in greater detail in table 3. The total amount of undesirable behavior is represented by 23.3 per cent before and 76.6 per cent after reduction in play materials, a total increase of 53.3 per cent. Crying, teasing and quarreling occur oftener especially with boys in the three and five year old groups.

Few conclusions concerning sex and age can be drawn with such small figures. In general, however, girls exceed boys (table 2) slightly in the total amount of exercise while boys tend to exceed girls in the use of materials and in undesirable behavior. When the playground is reduced girls engage in more games and boys in relatively more undesirable behavior.

An analysis by age (table 4) indicates that the five-year olds engage on the average in more bodily exercise before the play materials are removed than the three or four-year olds while

TABLE 3  
*Undesirable activity before and after a reduction in play equipment*  
 Number of girls 15, boys 18

	NUMBER OF OCCURRENCES												PER CENT OCCURRENCES		
	3 years			4 years			5 years			All children			All children		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
Before															
Tease.....	2		2	1		1				3		3	13.6		10
Cry.....		2	2	1		1				1	2	3	4.6	25.0	10
Quarrel.....															
Hit.....				1		1				1		1	4.6		3.3
After															
Tease.....	1		1	1		1	5	2	7	7	2	9	31.8	25.0	30
Cry.....	4	1	5				1	2	3	5	3	8	22.7	37.5	26.7
Quarrel.....	1	1	2					2	2	3	1	4	13.6	12.5	13.3
Hit.....	1		1	1		1				2		2	9.0		6.7
Total before.....	2	2	4	3		3				5	2	7	22.7	25	23.3
Total after.....	7	2	9	2		2	8	4	12	17	6	23	77.2	75	76.6
Difference in favor of the reduced playground.....													54.5	50	53.3

TABLE 4  
*Age difference in play activities before and after a reduction in play equipment*

	NUMBER OF OCCURRENCES						MEAN NUMBER PER CHILD					
	Before			After			Before			After		
	Age in years											
	3	4	5	3	4	5	3	4	5	3	4	5
Bodily exercise.....	94	174	156	78	173	94	13.4	11.6	14.2	11.1	11.5	8.5
Play with materials:												
Permanent.....	8	27	18	46	134	94	1.1	1.8	1.6	6.6	8.9	8.5
Experimental.....	36	105	48				5.1	7.0	4.4			
Undesirable behavior.....	4	3		9	2	12	0.6	0.2		1.3	0.1	1.1
Games.....				3	2	22				0.4	0.1	2.0
Teacher contacts.....		3		4	1	3	0.4			0.6	0.1	0.3
Temporary absence.....	2	6	9	7	3	6	0.3	0.4	0.8	1.0	0.2	0.5
Number of child observations....	147	315	231	147	315	231	21	21	21	21	21	21
Number of children.....	7	15	11	7	15	11	7	15	11	7	15	11

the four-year olds make more use of reduced all groups tend to occupy materials. When the playground is themselves slightly less with exercise,

more with sand and dirt, more with games and undesirable behavior, the noticeable differences in these direc- 26.7  $\pm$  3.4 per cent on the reduced playground with an absolute increase occurring in connection with each

TABLE 5  
*Social contacts before and after a reduction in play equipment*

	SEX	NUMBER OF OCCURRENCES										PER CENT OCCUR-RENCES		D	PE <sub>d</sub>
		Before			After			Total		Total		All children			
		Age													
		3	4	5	3	4	5	Before	After	Before	After	Before	After		
Bodily exercise	B	29	15	30	29	37	10	74	76						
	G	14	10	32	15	28	14	56	57	130	133	68.4	40.4	28.0 ±3.9	7.2
Permanent materials	B	14		9	21	22	45	23	88						
	G	2	2	6	6	23	26	10	55	19	143	10	43.3	33.4 ±5.4	6.2
Experimental materials	B		2	7				9							
	G	1		9				10		33		17.3		17.3 ±4.4	3.9
Undesirable behavior	B	2	1		6	1	7	3	14						
	G	2			2		2	2	4	5	18	2.6	5.4	2.8	
Games	B				1	1	4		6						
	G				2	1	18		21	0	27		8.2	8.2	
Teacher contacts	B	1			2	1	2	1	5						
	G	2			2		1	2	3	3	8	1.5	2.4	0.9	
Total contacts	B	46	18	46	59	62	68	110	189						
	G	21	12	47	27	52	61	80	140	190	329	99.8	99.8		
Number of children	B	5	8	5	5	8	5	18	18						
	G	2	7	6	2	7	6	15	15	33	33				
Mean number of social contacts	B	9.2	2.2	9.2	11.8	7.7	13.6	6.1	10.5						
	G	10.5	1.7	7.8	13.5	7.4	10.1	5.3	9.3	5.7	9.9				
Per cent of all social contacts	B							21.2	36.4	36.3	63.3			26.7 ±3.4	7.8
	G							15.4	26.9						

tions appearing in the five-year old group.

The number of social contacts (table 5) is significantly increased

type of behavior. Relative differences, however, expressed in terms of the per cent of all occurrences before and the per cent of all occurrences



after indicate considerable change in the nature of the contacts made after the play materials are removed. Social play is increased  $33.4 \pm 5.4$  per cent in play with materials (sand and dirt) 2.8 per cent in undesirable situations and 8.2 per cent in games at the same time that it is relatively and significantly decreased  $28.0 \pm 3.9$  per cent in connection with bodily exercise. An analysis of social contacts by age and sex indicates that boys tend to make more contacts than girls, the mean number being respectively for boys and girls 6.1 and 5.3 before and 10.5 and 9.3 after removal of materials. Boys exceed girls in the number of contacts made in bodily exercise, in play with materials and in undesirable behavior while girls exceed boys in the number made in games. Four-year old boys and girls make fewer average social contacts than three and five-year olds.

In general, then the University Elementary School is characterized after the reduction of play materials by less bodily exercise, more play with sand and dirt, more games, more undesirable behavior and a greater number of social contacts than are noted on the playground when the experimental materials are present. Dow (2) reports "there is more material and non-social play on equipped playgrounds and more non-material and social play on unequipped playgrounds."

## II. THE EFFECT OF THE INTRODUCTION OF CONSIDERABLE PLAY EQUIPMENT ON THE BEHAVIOR OF THE CHILDREN ON TWO PUBLIC SCHOOL PLAYGROUNDS

The effect of the introduction of considerable play equipment on the

behavior of children was investigated in studies made on two different public school playgrounds at Jackson, Michigan.

The playgrounds, designated here as School A and School B, were first surveyed with the regular equipment and then again after the addition of new play materials. The regular equipment consisted of a sand box and whatever toys the children brought day by day from home. The new materials which were added to each playground before the second survey was made are listed in table 1 with other information concerning the 75 children, 39 boys and 36 girls, their ages, the types of observations and the experimental variables.

The same categories for classification as those used in the University Elementary School are used here. The specific items are similar though not identical as will be seen in the tables. The same general tendencies are present on both playgrounds (table 6). Bodily exercise is decreased in amount after the introduction of new play materials to the extent of  $33 \pm 3.0$  per cent of all activities for School A and  $17 \pm 2.6$  per cent for School B. Play with materials is increased in the enriched situation  $42.1 \pm 3$  per cent for School A and  $20.8 \pm 4.3$  per cent for School B. Play with experimental materials is increased very much more than play with permanent materials, the increase for the experimental and permanent materials being respectively  $48.0 \pm 2.0$  per cent and  $6.0 \pm 3.6$  per cent for School A and  $32.9 \pm 2.9$  per cent and  $12.5 \pm 4.7$  per cent for School B. Undesirable behavior and games are decreased in amount on both playgrounds after

TABLE 6

*Activities on two public school playgrounds before and after the introduction of building materials*

	NUMBER OF OCCURRENCES				SCHOOL A		SCHOOL B		SCHOOL A		SCHOOL B	
	School A		School B		Per cent		Per cent		D	PE <sub>d</sub>	D	PE <sub>d</sub>
	Before	After	Before	After	Before	After	Before	After				
<i>Bodily exercise:</i>												
Vigorous:												
Run .....	74*	23	64	26	13.4	4.2	17.9	7.4				
Skip .....	21	30	74	79	3.8	5.4	20.7	22.6				
Jump .....	15	2	6	3	2.7	0.4	1.8	0.8				
Climb .....	5	3	20	21	0.9	0.5	5.6	6.0				
Less active:												
Stand .....	143	61	87	56	25.9	11.0	24.3	16.0				
Sit .....	52	13	8	16	9.4	2.4	2.2	4.5				
Walk .....	13	9	29	21	2.4	1.6	8.1	6.0				
Total vigorous .....	115	58	164	129	20.8	10.5	45.8	36.8	10.3 ± 3.7	2.8	9 ± 3.8	2.4
Total less active .....	208	83	124	93	37.7	15.0	34.6	26.5	22.7 ± 3.4	6.7	8.1 ± 4.2	2
Total exercise .....	323	141	288	222	58.5	25.5	80.4	63.4	33.0 ± 3.0	11.0	17.0 ± 2.6	6.5
<i>Materials:</i>												
Permanent:												
Sand .....	25	54	46	7	4.5	9.9	12.9	2.0				
Broom .....	21	5	9	3	4.0	0.9	2.5	0.9				
Wagon .....	13	11			2.3	2.0						
Garden .....	1	18			0.2	3.3						
Horse .....	18				3.2							
Rake .....	13				2.3							
Ball .....	9				1.6							
Shovel .....	8				1.4							
Leaves .....	7				1.3							
Truck .....		7				1.3						
Doll cab .....	5	1			0.9	0.2						
Miscellaneous .....	11	2	2	2	2.0	0.4	0.6	0.6				
Experimental building materials .....		265		115		48		32.9				
Total permanent .....	131	98	57	12	23.7	17.8	16.0	3.5	6.0 ± 3.6	1.7	12.5 ± 4.7	2.7
Total experimental .....		265		115		48		32.9	48.0 ± 2.0	24.0	32.9 ± 2.9	11.3
Total materials .....	131	363	57	127	23.7	65.8	16.0	36.3	42.1 ± 3.0	14.0	20.3 ± 4.3	4.7

\* One item represents one record in one five-minute interval of time, 74 represents the number of items of running in a total of 552 records. There were 46 children in School A and 29 children in School B.

TABLE 6—*Concluded*

	NUMBER OF OCCURRENCES				SCHOOL A		SCHOOL B		SCHOOL A		SCHOOL B	
	School A		School B		Per cent		Per cent					
	Before	After	Before	After	Before	After	Before	After	D	PE <sub>d</sub>	D	PE <sub>d</sub>
Undesirable behavior...	18	4	5	1	3.3	0.7	1.4	0.3	2.6		1.1	
Games.....	6	2	8	0	1.1	0.4	2.2		0.7		2.2	
Temporary absences...	74	42			13.0	7.6			5.4			
Total.....	552	552	358	350	99	99	99	99				
Less duplications in recording.....			10	2								
Total child observations.....	552	552	348	348	99	99	99	99				

the introduction of new materials. The numbers in these categories, however, are too small to determine the significance of the decrease.

The sex differences (table 7) are the same for both types of playgrounds and they agree with those found for the University Elementary School. Girls engage in general in more bodily exercise than boys and boys are more occupied with materials and undesirable behavior. The differences are increased after the addition of play equipment.

#### SUMMARY AND CONCLUSIONS

Amounts and types of play activities appear to be consistently related in these investigations to types of playgrounds. This is true whether the group has previously been accustomed to considerable or to meager equipment.

Children are very resourceful in all situations, on meagerly as well as on generously equipped playgrounds.

Bodily exercise and play with mate-

rials rank high in amount on all playgrounds as compared with games and undesirable behavior and do not seem to be entirely dependent upon extensiveness in equipment.

The same groups, however, when they are more extensively equipped, engage on the same playground in greater amounts of bodily exercise or play with materials and in lesser amounts of undesirable behavior and social play.

The more extensively equipped playground for each group is characterized by a greater combined amount of bodily exercise and play with materials and fewer social contacts in games and undesirable behavior. The less extensively equipped playground for each group is characterized by a lesser combined amount of bodily exercise and play with materials and a greater number of social contacts and social conflicts.

Consistent tendencies are found in that the absence or subtraction of materials is reflected in an increase

in the use of permanent materials whereas the presence or addition of materials is reflected in a decrease in the use of permanent materials. In all instances the presence of equip-

In general, it would appear that individual endeavour is encouraged while social contact and undesirable behavior are discouraged by the relatively more extensive equipment.

TABLE 7

*Sex differences on two public school playgrounds before and after the introduction of building materials*

		NUMBER OF OCCURRENCES						PER CENT OCCURRENCES				D/PE <sub>d</sub>
		School A		School B		Both schools		Both schools		Difference in favor		
		Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	
Bodily exercise . . . . .	Before	131	192	134	154	265	346	55.9	79.3			9.4
	After	36	105	82	140	118	245	25.2	56.4			
Permanent ma- terials . . . . .	Before	95	36	41	16	136	52	28.6	11.9	16.7	±3.9	9.2
	After	57	41	10	2	67	43	14.3	9.9	4.4	±4.2	
Experimental ma- terials . . . . .	Before	172	93	87	28	259	121	55.3	27.8	27.5	±3.3	8.3
	After											
Undesirable behav- ior . . . . .	Before	17	1	4	1	21	2	4.4	0.4	4.0		0.1
	After	2	2	1	0	3	2	0.6	0.5	0.1		
Games . . . . .	Before		6	7	1	7	7	1.5	1.6			0.5
	After		2				2		0.5			
Temporary absences .	Before	45	29			45	29	9.5	6.7	2.8		0.3
	After	21	21			21	21	4.5	4.8			
Total occurrences . .	Before	288	264	186	172	474	436					
	After	288	264	180	170	468	434					
Less duplications in recording . . . . .	Before			6	4	6	4					
	After			0	2	0	2					
Total occurrences . .	Before	288	264	180	168	468	432	99.9	99.9			
	After	288	264	180	168	468	432	99.9	99.9			
Number of children . .		24	22	15	14	39	36					

ment reduces games and undesirable behavior such as teasing, crying, quarreling and hitting while the absence of equipment increases games and social contacts.

From an immediate point of view it may be that individual endeavour can be increased and undesirable behavior decreased by introducing equipment. From a long-time point of view, how-

ever, too much equipment may greatly interfere with social development. On all playgrounds the total number of social contacts is accompanied by relatively few social conflicts. Social conflict should be studied in the light of its educational contribution to social development.

In conclusion, the amounts and types of play equipment need to be further investigated and understood

as to their functions and values giving attention both to individual and to social growth. The implications of implementation apparently have far reaching significance for the general theories of social development. It may be that investigations of this type in various small groups will serve gradually to clarify certain principles applicable to larger groups and to community relationships.

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# Rorschach Norms for an Adolescent Age-Group

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THE Rorschach Ink-blot Test was originally applied to 405 subjects, 117 normal persons of whom 55 were reported "educated" and 62 "uneducated," the others, mentally disordered cases. Tables containing Rorschach's norms for these normal and psychotic groups are presented in the original manual (10, 11). No statistical computations are included in this study; no mention is made of variability in the groups. The figures, based on few subjects and these, for the most part, abnormal, can only be taken as tentative suggestions.

Since the publication of Rorschach's monograph, many studies (2a) have been made on the technique and symptomatic value of the test factors. The method has been applied extensively in various personality studies. In many of these studies, norms for the different test factors and for the respective age-groups examined have been presented, in terms of averages, means, or medians. A review of these shows that many agree to some extent with the tentative norms published by Rorschach for similar groups. The results of many studies agree likewise among themselves. On the other hand, there are many disagreements,

often for similar age-groups. The data are not, of course, comparable because of the variety of methods of administration and of scoring employed, and because of other variable factors, such as race and social and economic status.

A few studies of comparatively "normal" children have been reported by Löpfle (8) for ages ten to thirteen, Loosli-Usteri (7) ages ten to twelve, Behn-Eschenburg (1) for ages thirteen to fifteen, Kerr (4) seven to fourteen, and Mira (9), fourteen to sixteen years. Behn-Eschenburg (1) working under the personal direction of Rorschach studied various phases of mental life and changes taking place in the "Erlebnistypus" during adolescence. He applied the test to 209 boys and girls, selected at random in the "Realschule" and "Volksschule" in Zürich. Although the blots used were not the original ones, he reported that they were parallel to them, having been standardized to correspond to the original. Results were computed, and comparisons were made between the different school grades, between the "Realschule" and "Volksschule" and between the sexes.

Löpfle (8), interested in the technical aspects of the Rorschach method and

in its practicality for studying school children, selected subjects from various grades in the "Volkschule" in Zürich and from divers population districts. He established norms for the respective test factors and for his different age-groups. A similar sample was selected by *Loosli-Usteri* (7) from a Geneva public school with the twofold purpose of comparing, first, the Geneva results with those obtained by *Löpfe* with his Zürich children and second, the children living in an orphan asylum with those living at home.

*Schneider* (13) also computed norms for his groups of children. He used the Rorschach to study children who were intellectually inhibited. Eighty-seven school children in special classes were given various psychological tests and also the Rorschach. Special study was made of subjects whose scores on the various tests differed widely, the assumption being that these discrepancies were due to defects in personality make-up.

*Kerr's* norms (4) for 365 English children including mental defectives and child guidance clinic cases have not yet been published. Two Spanish studies by *Linares* (5, 6) are reported containing results for normal children, 50 of each sex, and for feeble-minded and superior children.

*Vernon* (14) who worked with three adult groups, has summarized the norms of some of the above mentioned studies in a comprehensive table which includes norms for his groups and for other adult and feeble-minded groups.

Because so few norms are available for "normal" children, one of the projects included in the investigation

planned by the Brush Foundation was to establish norms for a definite age group which would be statistically reliable and which could be put to practical application in interpreting Rorschach scores. Report (2) has already been made of the standardization of the method of administration of the Rorschach test and of the method of scoring.

Briefly summarizing, after a detailed study had been made of the method employed by Rorschach and of the subsequent changes attempted by other administrators, a preliminary experiment was performed with a "normal" miscellaneous group, an emotionally unbalanced group and a neurotic group. The Rorschach records were scored for certain general test factors and the results submitted to statistical analysis. Results showed satisfactory reliability as judged by the coefficients of correlation obtained by the split-test method. Comparison of groups displayed some differences,—enough to warrant further experimentation with the method.

#### STANDARDIZATION OF ADMINISTRATION

On the basis of the experiences in the preliminary work, revision was made of certain steps in the procedure to insure standardized conditions and to make the test easier to administer and to make scoring more accurate and more objective. Personal Data Sheets, Record Blanks, and Summary Sheets were prepared for quick and efficient recording of all necessary data. A trial blot was introduced to make the responses to the first card more comparable with the rest and in order to establish a favorable mental



set at the beginning. Systematic and uniform directions were prepared and memorized. Diagrams were made for each blot, parts of the blot being assigned symbols in the form of letters and numbers, for indicating the exact location of the detail selected for interpretation. Symbols were likewise adopted for indicating the position in which the blot was held, and a key to the English scoring symbols was prepared for use. Finally, the reaction time was limited to two minutes per blot.

The test was given to 300 students of the Patrick Henry Junior High School, 150 boys and 150 girls, selected as representative of average American-born white children. They were selected at random as to chronological age, class standing and school grade. Attempts were made, however, to see that the subjects represented as far as was possible an even distribution according to mental capacity. Table 1 presents the distribution for boys and girls according to chronological age, with the average C.A. for the boys, the girls, and the whole group. The distribution for both boys and girls, and for the group approximate the normal curve.

All the subjects had received the Otis Self-Administering Intermediate Examination, Form B at the Brush Foundation in the course of the two years in which the investigation of the Rorschach Test took place. To insure the accuracy of the Intelligence Quotients obtained on this test, they were checked against the latest ratings of the subjects as recorded on the files of the school. These ratings had been obtained on the basis of other

intelligence tests, namely the Otis Form A, the Haggerty Test and the Cleveland Test. A correlation of  $+.857 \pm .011$  was obtained, indicating a satisfactory reliability of the intelligence quotients as indicated by the Otis Test, Form B.

TABLE 1

*Distribution of Patrick Henry subjects according to chronological age and sex*

C.A.	BOYS	GIRLS	TOGETHER
12, 6-12, 11	11	11	22
13, -13, 5	23	25	48
13, 6-13, 11	29	31	60
14 -14, 5	27	30	57
14, 6-14, 11	32	31	63
15 -15, 5	16	14	30
15, 6-15, 11	6	4	10
16, -16, 5	6	4	10
Total.....	150	150	300
Aver.....	14.2	14.1	14.2
SD.....	7.2	9.9	10.26

TABLE 2

*Distribution of Patrick Henry subjects according to Intelligence Quotients*

LEVEL	I.Q.	BOYS	GIRLS	TOGETHER
Low Average.....	70-89	19	11	30
Average.....	90-109	56	59	115
Superior.....	110-119	34	45	79
Very Superior.....	120-139	41	35	76
Total.....		150	150	300
Aver.....		106.7	107.6	107.2
SD.....		15	13.5	14.3

Table 2 shows the distribution of the subjects according to these Intelligence Quotients. The average Intelligence Quotient is 107.2. The distribution also approximates the normal curve. However, the group which was selected as an average group, must be

viewed as a high average group in view of the average Intelligence Quotient. It should be observed that in this group 115 subjects comprised an "average" group in the sense that the Intelligence Quotients ranged from 90 to 109.

#### *Standardization of the scoring method*

The Rorschach test records obtained from the group of 300 were subjected to statistical analysis and definite quantitative and qualitative criteria were determined for scoring the different Rorschach factors. Responses were tabulated for each ink-blot and Frequency Tables constructed for the determination of scores in respect to W, D, Dr, Do, F+, F-, O+, O-, I, and P. The scoring method was found to be reliable as judged by the extent of agreement between scores of one judge and those of another on 100 records selected at random.

*Reliability of the test in its standardized form.* Report has likewise been made of the reliability of the Rorschach test as modified by the Brush Investigation (3). On the basis of 100 records selected at random from the group of 300 students, reliability coefficients of the test factors were computed by the corrected split-half method. Results ranging from .9 to .6 were considered satisfactory.

#### PROBLEM

After the method of administration and scoring had been determined and the reliability of the test had been satisfactorily determined, the averages for the various test factors were computed for the purpose of obtaining norms for an adolescent group on the basis of the test in its standardized

form and of comparing these results with those of Rorschach for adults.

#### *Results*

Table 3 presents the norms obtained with the adolescent group. For purposes of comparison, Rorschach's results for average adults are reproduced, with those of Behn-Eschenburg (1), Löpfe (8), and Loosli-Usteri (7) since their respective groups corresponded in age to the present group. Behn-Eschenburg's group ranged from thirteen to fifteen years which corresponds to the middle of our group. Both the other groups appear to be younger than the present experimental group. In comparing these norms, it must be kept in mind that the technique of administration and of scoring varied with the investigator and that the composition of the groups likewise differed to a great extent.

*Total number of responses (R).* The Patrick Henry group averaged 27.05 R, Standard Deviation 8.85, the approximate normal range being 18 to 36. Herein the approximate range is computed by taking one standard deviation above and below the average, thereby marking off the limits of the middle two-thirds of the distribution. This range corresponds to Rorschach's figures for adults. Loosli-Usteri reported a median of 23, the other two investigators, however, reported higher averages, 33.6 and 42 respectively.

*Whole answer (W).* In the Patrick Henry group, an average of 6.78 W was obtained, Standard Deviation 4.74. The approximate norms were considered 2-10. This range includes Rorschach's norms. This average is slightly higher than those reported by

Behn-Eschenburg (5.8) and Loosli-Usteri (5.) but considerably more than that of Löpfle (3.7).

*Normal detail answer (D).* Rorschach did not give norms for the normal details given by his average adults. In a subsequent article Rorschach indi-

three investigators who obtained 18.4, 19.0, and 15 respectively.

*Rare detail answers (Dr).* The rare detail answers were studied from two different aspects (a) when the oligophrenic category was considered and (b) when this category was omitted.

TABLE 3  
Rorschach norms for different groups

	RORSCHACH	HERTZ	BEHN-ESCHENBURG	LÖPFLE	LOOSLI-USTERI
Subject.....	†	300	209	120	63
Age.....	Adults	12, 6-16, 5	13-15	10-13	10-12
Test Factor					
R.....	15-30	27.05 (3.21)	33.6 (9-81)	42 (8-199)	23 (8-109)
W.....	4-7	6.78 (4.74)	5.8 (0-18)	3.7 (0-17)	5 (1-15)
D.....		14.08 (6.55)	18.4 (4-36)	19.0 (6-54)	15 (0-56)
Dr.....		1.93 (4.38)	7.1 (0-54)	13.5 (0-133)	2 (0-30)
Do.....		0.96 (1.70)	0.9 (0-10)	1.5	0 (0-3)
DS.....		1.73 (1.80)	1.0 (0-7)	2.3	1 (0-22)
%F+.....	70-80%	88.80% (3.09)	71 (55-100)	75% (23-100)	80% (43-100)
M.....	2-4	2.62 (3.71)	1.3 (0-5)	0.9 (0-9)	0 (0-6)
C Score.....	0.5-2.5	1.34 (1.51)	1.3	2.7	1 (0-29.5)
%A.....	30-55%	54.13% (10.77)	47% (15-90)	55% (20-100)	57% (27-100)
%O.....	0-20%	6.78% (8.53)		25%	
%P.....		25.55 (6.65)		11 (0-37)	21 (3-50)

cated that for a score containing 34 responses in all, the following combination should be expected 8 W, 23 D, 2 Dr, 1 Ds and 0 Do. The average for the adolescent group was 14.08 Standard Deviation 6.55, giving a range of approximately 7 to 21. This compares favorably with the results of the other

An average of 1.93 Standard Deviation 4.38 was obtained when the oligophrenic factor was considered. This figure corresponds to Rorschach's estimate on the basis of 34 responses. The range of about 0 to 6 is much shorter than the ranges presented by the other investigators. The average ap-

proaches the median of Loosli-Usteri (2) but is much smaller than the averages of the other two investigators. Results for the Dr factor computed without scoring the Do factor (which was found to be more reliable), was 2.31 Standard Deviation 3.6.

*Oligophrenic detail answers (Do).* The adolescent group studied gave an average of .96 Do Standard Deviation 1.7. As indicated above, Rorschach did not expect to find any Dos in the score on the basis of 34 responses. The other investigators referred to above report few or no Do responses in their respective groups. These results appear to be in agreement.

*Space detail factor (DS).* The average space detail answers given by the group was 1.73, Standard Deviation 1.8. Rorschach expected 1 DS to appear in 34 responses given by a normal adult. The other investigators likewise reported comparatively few DS responses in their respective groups of children.

*Form percentage (%F+).* Examination of Rorschach's norms for average adults shows a range of 70 to 80 per cent. The average for the Patrick Henry Group was 88.8 Standard Deviation 2.09 indicating a range much higher than that of Rorschach. These figures are likewise much higher than the results reported by the other investigators.

*Movement answers (M).* The Junior High School group had an average of 2.62 M, Standard Deviation 3.71. Rorschach's adults gave from 2 to 4 movement answers. The average here compares favorably with that of Rorschach but appears to be higher than

the results of the other writers for the movement factor.

*Sum color score (C).* The average color score for the group was 1.34 Standard Deviation 1.51, the approximate norm being 0-2.8. This compares well with Rorschach's range of 0.5 to 2.5. The results of the other writers likewise approximate this norm.

*Animal percentage (%A).* The average obtained with the present group of 54.13 Standard Deviation 10.77 compares favorably with that reported by Rorschach and also with the figures in the other studies. The upper range of Rorschach's figures appear to be the average for children.

*Original percentage (%O).* The average original per cent of the adolescent group was 6.78 Standard Deviation 8.63. The approximate norm here (1-15 per cent) compares well with Rorschach's estimate of 0-20 per cent. Löpfe's average is 25 per cent, which is considerably higher than the average obtained in the present study.

*Popular answer percentage (%P).* An average of 25.55 per cent Standard Deviation 6.64 for the present group is considerably higher than the average of Löpfe which was 11 but compares better with Loosli-Usteri's figure of 21. This factor was not defined in the original work of Rorschach, but it was introduced in a later article (12) as a response given at least by one in three persons. Löpfe and Loosli-Usteri finding this standard too high, adopted the criterion of one in six. The criterion employed in the present study corresponded to the one-in-six. It was statistically computed and based on the 80th percentile in the distribution

for form frequency, the criterion for the 0+ per cent being based on the 20th percentile. Despite the fact that the same criterion for P is used, it must be noted that the popular responses for each blot reported in the different studies do not correspond in all instances.

#### SUMMARY

1. The approximate norm for many of the Rorschach factors obtained in the present study with an adolescent group of 300 students corresponds favorably with Rorschach's results for adults.

2. The results herein obtained likewise compare favorably with those contained in other studies with normal subjects for similar age groups.

3. The average whole answer reported for the group is slightly higher than that reported by the other investigators, while the average normal detail answer is slightly lower.

4. Present results for the oligophrenic detail answer and the space detail answer correspond favorably with all the other results.

5. The average percentage of good forms for the group studied is considerably higher than that reported for the other groups.

6. The average movement answer is likewise higher for the present group.

7. The average color score and the animal percentage compare favorably with the approximate figures reported by the other investigators.

8. The average original percentage for the present group approximates Rorschach's norms but is considerably lower than that of Löpfle.

9. Results for the popular answer factor correspond to those of the other investigators.

10. The average number of responses compares favorably with Rorschach's estimate. The normal range computed in the present study includes those results of the other writers.

#### Conclusion

The norms herein reported are based upon findings with 300 adolescent Junior High School students, American-born, residing in Cleveland, and satisfactorily distributed as to mental and chronological ages. They correspond in general to those reported by Rorschach for adults and to those published by three other investigators for similar age groups. The discrepancies which do occur in places probably can be accounted for by the fact that the present group is a high average group. These norms may be employed tentatively for the interpretation of Rorschach test scores given to similar age groups, in the absence of other norms and until further investigation is made with the test on larger and more representative groups.

Attempts to apply such norms to groups materially different from that herein described must be made with caution. Strictly speaking they are applicable only to similar groups similarly selected. However, in the absence of norms for other groups, these figures could be used, bearing in mind the composition of the original sample upon which they were based, and accepting only those results which show statistical reliability.

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# An Adolescent Personality Schedule

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## PROBLEM

ADOLESCENTS, as a rule, respond to the interview as a diagnostic and remedial technique more satisfactorily than any other age group. They have a mastery of verbal facility which the younger child lacks and they have not yet acquired the fixity of repressions and verbal defense mechanisms which impede the progress of the interview with an adult. Because of this initial advantage, interview technique, as it relates to adolescent problems, presents a field which will repay efforts toward further methodological development. The statistically controlled interview, exemplified by mental hygiene inventories and personality schedules is a timesaving and illuminating starting point for any interview if the schedule be well constructed. The Thurstone Personality Schedule for adults offers many advantages from the point of view of ease of presentation, economy of time used in answering and scoring and of statistical reliability. For this reason we used it as a model for a projected statistically controlled interview suitable for use with adolescents.

The work herein reported was conducted at The Wichita Child Research Laboratory between January, 1930 and May, 1934. We are deeply indebted to Dr. L. L. Thurstone for suggestions and guidance through-

out the progress of the work and for permission to make a comparative study of our results with his; to Mr. L. W. Mayberry, Superintendent of the Wichita Public Schools, to Mr. J. E. Stinson, Principal of Allison Intermediate and to the teachers of Allison Intermediate for the generous gift of their interest and time in assisting us to present the questions to the student population of the school; and to the many friends in different professions whose work brought them into contact with adolescents and who helped us with criticisms and suggestions when we were compiling our initial list of questions.

## Method

In the compilation of the first list of questions we were guided somewhat by questions asked and remarks made by adolescents and recorded in the case histories of children who had been interviewed at the Wichita Child Research Laboratory. This source of suggestion was supplemented by the observations of the authors, all of whom had had intimate experience with adolescents and one of whom (Mrs. M. C. McClellan) was at that time the public school teacher in the Girls' Detention Home for Sedgwick County. Questions were also furnished by teachers, by social workers and by workers in summer camps for boys and girls of adolescent age. Some questions were suggested by those found in adult personality inventories and schedules.

The completed list of questions was



then submitted to a number of teachers in both private and public schools; to directors and workers in summer camps; and to ministers, psychologists and social workers. These were asked to rate the questions in what seemed to them to be the order of importance for inclusion in a final list. In making this rating they were asked to consider the importance for personality development of the subject matter of the question; the degree of illumination the answer might shed on potential personality difficulties of adolescents; and the chances of getting from the adolescent an answer based on a reliable comprehension of the meaning of the question as related to his own experience. Those, who were asked to rate the questions, were also asked to suggest new questions of their own and to include these in their rating lists.

A study of all the rated lists showed a surprising degree of uniformity among them as to the judgment of relative importance of the questions. We selected the questions which showed a high frequency of favorable rating and compiled a list of three hundred and thirty.

The questions were printed in double columns in a four paged leaflet. A "Yes," a "No" and a question mark were at the side of each question in an arrangement which permitted answering by means of circling the appropriate response in the manner used by Thurstone. The distribution of the responses was varied eccentrically to avoid any halo effect as an influence on the replies.

Arrangements were made with the school authorities to present this questionnaire to the entire school popula-

tion of one of the large intermediate schools. All the children took the test simultaneously. An hour was given to the test and each class was working in its home room under the home room teacher. The children were given to understand that the test was part of the regular school program and encouraged to answer readily and as truthfully as possible. No discussion of the questions was allowed among the children or between the children and teacher but the teacher was allowed to explain the meaning of words which were unfamiliar. Each pupil wrote at the top of his sheet his age, birthdate, sex and school grade but they were not asked to write their names. The fact that there was no possible means of identification of the papers after they had left their hands was emphasized because we hoped the children might make their answers more spontaneously and honestly if they were sure the replies were to remain genuinely anonymous for all time. The fact that only three papers showed obvious lack of discrimination in the replies indicated that our hope was justified.

The school chosen represented a group of children fairly homogeneous in scholarship and social background. The residential district surrounding this school is neither the wealthiest nor the poorest in the city. It is populated chiefly by middle class families who are economically secure but not living in any pretentious style. The cultural background is average and on the whole produces students who make consistently successful but not brilliant records of academic achievement. It seemed to us this school presented an ideal situation from the point of view

of securing a large number of children from a uniformly average environmental background.

Six hundred and forty-eight children took the test. Three hundred and twenty-two of them were boys and three hundred and eleven of them were girls. Inevitably some of the children did not clearly understand all of their instructions and some of the information as to sex, age, etc. failed to appear on a few of the papers. This partial failure to fulfill instructions invalidated these papers for part of the statistical work but not for all of it. Therefore some of the statistical figures will vary as to the number of cases upon which they are based. Fifteen papers were not finished within the hour allowed for the test. On nearly every paper there were at least two or three questions that were unanswered. This was probably due to the fact that the questions were printed closely together and one could easily be overlooked. The same confusion of printing probably explains the fact that occasionally a question was answered twice.

Our first analysis of the results led to the elimination of some of the questions. The detailed method by which this elimination was reached will be presented with the results. When this elimination process was finished the results of the remaining questions were subjected to the procedure and technique used by Thurstone (1) in developing his personality schedule for college students.

## RESULTS

### A. Elimination technique

All of the papers were divided into two groups according to sex. The

number of "Yesses," "Noes," "?," and "Unanswered" replies were tabulated for each group and the total for the entire group calculated. When this tabulation was completed twelve questions were eliminated, because they had been answered with 90 per cent uniformity either as "Yes" or "No."

The entire group of remaining questions was classified according to the following headings:

1. Fears
2. Inferiorities and insecurity
3. Family situations involving non-authoritative emotional relationships
4. Family situations involving authoritative relationships
5. Non-family authoritative situations involving emotional reactions
6. Opportunities for personal responsibilities in home situations, in school situations and in social relations with other children and reactions to these opportunities
7. Ambitions
8. Frustrations
9. Escapes
10. Neurotic symptoms
11. Compensatory devices

In carrying the elimination program further these headings were borne in mind. We felt that the final list of questions must represent a division into these groups which would not be overbalanced in favor of any one group. Part of the questions were discarded which the first tabulation showed had been answered predominantly in either the affirmative or negative. Others which showed this predominance in favor of one or the other were retained if there were some reason which made their retention advisable such as qualitative value of the question for diagno-

sis or need to include the question to help maintain balance among the classification groups. In some instances the phraseology of the questions seemed to have been confusing and these were discarded. Finally all questions with duplicated content were discarded. We found there were very few questions left in groups seven and eight. We, therefore, put into other groups such questions as remained in groups seven and eight after the foregoing elimination process.

Two hundred and eleven questions survived the discard, and were distributed among the classification headings as follows:

1. Fears.....	21
2. Inferiorities and insecurity.....	27
3. Family situations involving non-authoritative emotional relationships.....	30
4. Family situations involving authoritative relationships.....	16
5. Non-family authoritative situations involving emotional reactions.....	15
6. Opportunities for personal responsibilities in home situations, in school situations, and in social relations with other children, and reactions to these opportunities.....	29
9. Escapes.....	18
10. Neurotic symptoms.....	35
11. Compensatory devices.....	20

This final revised list of two hundred and eleven questions was then subjected to a statistical scoring and rating program.

#### *B. Scoring and rating*

Empirical maladjusted answers were determined upon for the two hundred

and eleven questions which comprised the revised list. The empirical answers were justified by statistical evidence for 195 questions. For these questions the maladjusted answers were numerically the fewest. Most of the fifteen questions whose empirical maladjusted answers were not statistically justified disappeared from the list in later statistical elimination.

Stencils were made for the maladjusted answers and all the papers were scored. The score for each paper was arrived at by counting the maladjusted answers. The fifty papers showing the highest scores and the fifty papers showing the lowest scores were segregated. For each of these groups of fifty, the number of maladjusted answers was tabulated for each question. As a result of this tabulation, ten questions were eliminated because the scores in the two groups were so nearly equal that the questions were judged to have little diagnostic value.

The group having the lowest number of maladjusted answers was found to have the larger number of maladjusted answers in the case of eight questions. The maladjusted answers for these eight questions were therefore reversed. For instance, the empirical maladjusted answer was "No" to the question, "Are mystery stories good reading?" The results for this question as answered by Group "A" (the group with the largest number of maladjusted answers) were:

16 answered "No"  
34 answered "Yes"

Group "B" (the group having the lowest number of maladjusted answers) answered as follows:

25 answered "No"  
25 answered "Yes"

This would indicate that for adolescents the maladjusted answer to this question is "Yes."

New stencils were made on the basis of these findings and the papers were re-scored. The following table (table 1)

TABLE 1  
*Frequency table*

MALADJUSTMENT SCORE	BOYS	GIRLS	TOTAL	TOTAL (THURSTONE)*
0-4	0	0	0	15
5-9	1	0	1	37
10-14	3	2	5	57
15-19	5	8	13	65
20-24	18	9	28	67
25-29	24	14	39	66
30-34	38	18	57	50
35-39	25	23	51	64
40-44	22	39	62	37
45-49	27	27	54	60
50-54	23	33	57	44
55-59	27	29	57	24
60-64	27	22	50	18
65-69	30	20	51	22
70-74	16	15	31	17
75-79	12	16	29	10
80-84	9	9	19	10
85-89	6	6	13	6
90-94	1	7	9	2
95-99	5	4	9	7
100-104	1	5	6	1
105-109	1	0	1	1
110-114	0	1	1	2
115-119	1	0	1	
120-124	0	4	4	
Total...	322	311	643	682

\*1929 edition of Thurstone personality schedule.

shows the frequency distribution for the entire group and for boys and girls separately. It also presents a comparison with similar results for the Thurstone schedule (1929 edition of the Thurstone Personality Schedule).

Median scores for sex and age differences were established as follows:

	MEDIAN SCORE	NUMBER OF CASES
Boys.....	53	322
Girls.....	52	311
Both sexes combined.....	51	648

In establishing the median for both sexes combined we included the fifteen papers which did not state sex, which explains the fact that the median for both sexes is lower than that for either the boys or girls separately. There is no significant sex difference. Median scores for school placement are as follows:

	MEDIAN SCORE	NUMBER OF CASES
7th grade.....	50	161
8th grade.....	50	237
9th grade.....	51	193

There is no significant school placement difference. Median scores for age follow:

	MEDIAN SCORE	NUMBER OF CASES
12 years.....	47	79
13 years.....	52	195
14 years.....	49	203
15 years.....	53	125
16 years.....	48	29

The group included students who were 11, 17, 18 and 19 years old but their number was too small to justify the calculation of medians. We do not find significant differences within the age groups for which the medians were calculated.

Thurstone assigns meaning to the maladjusted answer scores as follows:

PER- CENT- AGE OF CASES	MALAD- JUSTED ANSWERS	GRADE	MEANING
15	0-14	A	Extremely well ad- justed
30	15-29	B	Well adjusted
40	30-59	C	Average
10	60-79	D	Poorly adjusted
5	Over 80	E	Should see a psy- chiatrist

1929 edition of Thurstone personality schedule.

Applying this interpretation to our own frequency table (table 1) we obtain the following rating for the adolescent schedule:

PER- CENT- AGE OF CASES	MALAD- JUSTED ANSWERS	GRADE	MEANING
15	0-29	A	Extremely well ad- justed
30	30-49	B	Well adjusted
40	50-74	C	Average
10	75-89	D	Poorly adjusted
5	Over 90	E	Should see a psy- chiatrist

The questions on our leaflet were printed in two parallel columns on each page as on the Thurstone blanks. We measured the reliability of this test by counting the number of maladjustments in the four left hand columns and the number of maladjustments in the four right hand columns. These two sets of scores were correlated by the Pearson product moment method. The correlation was  $.79 \pm .01$ . When the Spearman "prophecy" formula was applied to this correlation the reliability coefficient was found to be .84. These results are consistent with those of Thurstone.

The final set of questions comprising the Adolescent Personality Schedule follows:

1. Yes ? I like to be alone most of the time..... No
2. No ? Are books better friends than people?..... Yes
3. Yes ? I want to get away from home right away..... No
4. No ? I am afraid to go into a dark room alone at night..... Yes
5. No ? I like to work with my mother..... Yes
6. No ? I fuss with my brothers and sisters whenever I am with them..... Yes
7. Yes ? Do you spend time daydreaming when you should be working?..... No
8. Yes ? I cry when I get angry..... No
9. No ? I am afraid to talk to people..... Yes
10. Yes ? Do you ever go off by yourself and talk about your troubles?..... No
11. No ? I like to entertain my friends at home..... Yes
12. No ? Does fire or the smell of smoke make you afraid?..... Yes
13. Yes ? I got a lot of whippings..... No
14. No ? Do you cry easily?..... Yes
15. No ? Do you ever have a feeling of falling just before you go to sleep?..... Yes

16. Yes ? Do you ever feel that your parents do not love you?..... No
17. Yes ? My family embarrass me terribly..... No
18. No ? Is it fun to make things sound bigger than they really are?..... Yes
19. Yes ? Do you sometimes like to hurt a person or animal?..... No
20. No ? I have definite plans about what I want to do after I am through school... Yes
21. Yes ? Do you have the same dream over?..... No
22. No ? Are you usually to blame for your mistakes?..... Yes
23. Yes ? I chew on something most of the time, pencils, erasers, etc..... No
24. Yes ? Do you often leave work unfinished?..... No
25. Yes ? I am afraid that I will be talked about..... No
26. No ? Can you persuade other boys and girls to do things?..... Yes
27. Yes ? Do you like to have the opposite sex at your parties..... No
28. No ? Do you feel like fighting when someone gets the best of you in a game? Yes
29. No ? Do you like to talk about your troubles?..... Yes
30. Yes ? Have you ever been told that you couldn't be good?..... No
31. No ? Do your brothers and sisters do things better than you can?..... Yes
32. Yes ? Can usually control your temper?..... No
33. No ? Do you worry over your mistakes?..... Yes
34. Yes ? Is your mother happy?..... No
35. No ? Have you ever been told that you were stupid?..... Yes
36. Yes ? Do mothers have all the work and no fun?..... No
37. No ? My parents treat me like a baby..... Yes
38. No ? I have been teased a lot..... Yes
39. Yes ? It is fun to tease little children..... No
40. Yes ? I can think of good answers in class but I am afraid to tell them..... No
41. Yes ? Does your mother still consider you a baby?..... No
42. No ? Have you ever been told you couldn't tell the truth?..... Yes
43. No ? Can you play games as much as most boys and girls?..... Yes
44. Yes ? Do you feel that you are a very wicked person?..... No
45. Yes ? Does nagging make you want to do things you know are wrong?..... No
46. Yes ? Do any of your brothers and sisters envy you?..... No
47. No ? My hands and feet feel too big for the rest of me..... Yes
48. Yes ? Do you often feel there is just no use to try?..... No
49. Yes ? I seem to act just the opposite from what I feel..... No
50. Yes ? Do you like to be with people you can boss?..... No
51. Yes ? Do you have a hard time going to sleep after you go to bed?..... No
52. No ? Are you different from others in appearance?..... Yes
53. No ? Mother and father are partial to other children in our family..... Yes
54. Yes ? Do your parents ever tell you that you are good for nothing?..... No
55. No ? Do you have a hard time making up your mind about things?..... Yes
56. Yes ? Do you feel glad one minute and sad the next without any apparent reason? No
57. Yes ? I am my father's pet..... No
58. Yes ? Are you made fun of at home?..... No
59. No ? Do married people always quarrel?..... Yes



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60.	No	?	Do your parents find fault with you a great deal?	Yes
61.	Yes	?	Do you feel sort of tired a great deal of the time?	No
62.	No	?	Do you often vomit?	Yes
63.	Yes	?	My parents are fair	No
64.	Yes	?	Do you love your mother more than you do your father?	No
65.	No	?	Do you often cry yourself to sleep?	Yes
66.	Yes	?	Do you blush easily?	No
67.	No	?	I earn my own spending money	Yes
68.	No	?	Do you think you have a happy home?	Yes
69.	No	?	Do you mind going through tunnels?	Yes
70.	No	?	Do you feel free to talk to your parents about everything?	Yes
71.	Yes	?	Do you have stage fright?	No
72.	Yes	?	Do you have regular home duties?	No
73.	Yes	?	Do you dream about your school work?	No
74.	No	?	Do you like most everything to eat?	Yes
75.	Yes	?	Do you have a habit of reading a long time after you go to bed?	No
76.	No	?	Are you afraid of furred or feathered animals?	Yes
77.	Yes	?	Are you afraid of being left behind on pleasure trips?	No
78.	No	?	I find my school work burdensome	Yes
79.	Yes	?	Are you afraid of deep water?	No
80.	No	?	It worries me when I can't believe what my parents or the ministers say about religion	Yes
81.	Yes	?	Do you fidget a great deal?	No
82.	Yes	?	I am always scared that I will do the wrong thing	No
83.	No	?	Do you sometimes feel like doing just anything to get people to notice you?	Yes
84.	No	?	My feelings are easily hurt	Yes
85.	Yes	?	Do you often feel stupid?	No
86.	Yes	?	Do you think that little kids are a nuisance?	No
87.	No	?	Would you be afraid to go to the principal's office?	Yes
88.	Yes	?	Do you expect to get even with someone someday?	No
89.	No	?	Can you always find a good reason for losing?	Yes
90.	Yes	?	Do you feel like running away when things get too hard?	No
91.	Yes	?	Do you feel you are a lot different than other boys and girls?	No
92.	No	?	I hate to meet new kids	Yes
93.	Yes	?	When my feelings are hurt it is easier to keep it to myself than let anyone know	No
94.	Yes	?	I have a lot of friends	No
95.	Yes	?	Do you mind crossing a bridge over deep water?	No
96.	Yes	?	Are you ever afraid that folks will laugh at you?	No
97.	No	?	Do you have a chum?	Yes
98.	Yes	?	Can you stand pain quietly?	No
99.	Yes	?	Are you afraid of being kidnapped?	No
100.	Yes	?	Do you mind asking questions when you do not feel sure?	No
101.	Yes	?	Do you ever feel mean and like you hate everybody?	No



102. No ? Are you afraid to be out alone after dark?..... Yes
103. No ? Does it make you uneasy to cross a wide street?..... Yes
104. Yes ? Are you usually able to find your belongings when you want them?..... No
105. No ? Do you like help with your work?..... Yes
106. Yes ? Do you like to join and help organize gangs?..... No
107. Yes ? Is it often hard to resist setting fire to something?..... No
108. Yes ? Is it better to listen to your friends than to your conscience?..... No
109. No ? I won't be nice to people if they aren't nice to me first..... Yes
110. No ? My clothes never feel right..... Yes
111. No ? I hate things that are good for me..... Yes
112. No ? Do you feel sorry for many of your friends?..... Yes
113. Yes ? Is it difficult to plan your work ahead?..... No
114. Yes ? Do you stick to the gang regardless?..... No
115. No ? Is your school principal a flop?..... Yes
116. No ? I was always whipped for every little wrong I did..... Yes
117. No ? My relatives dislike me..... Yes
118. Yes ? I quarrel a lot with my parents to get to go some places..... No
119. No ? Do you go out for teams at school?..... Yes
120. No ? Must a school teacher be a very smart person?..... Yes
121. Yes ? Do you like to study about your body?..... No
122. No ? Older people do as they please..... Yes
123. Yes ? Most mothers and fathers are terribly old fashioned..... No
124. Yes ? I have awfully scary dreams..... No
125. No ? I like to fight..... Yes
126. No ? I like to read the "True Story" magazine..... Yes
127. No ? I have been teacher's pet..... Yes
128. Yes ? Modern young people know more than their parents..... No
129. No ? I have never been able to work very much..... Yes
130. Yes ? I have been badly hurt in an accident..... No
131. No ? It is dangerous for a girl to let a boy kiss her..... Yes
132. Yes ? I choose my own clothes..... No
133. Yes ? School teachers are usually cross and narrow minded..... No
134. Yes ? Big brothers and sisters are bossy..... No
135. No ? Mystery stories are good reading..... Yes
136. Yes ? Are Sunday School teachers queer?..... No
137. Yes ? It is better to be careful than to be adventurous..... No
138. No ? Do you know many queer people?..... Yes
139. Yes ? Did your parents ever whip you when you did not deserve it?..... No
140. Yes ? Are you the favorite child in your home?..... No
141. No ? Are your parents more strict than other parents?..... Yes
142. Yes ? My teachers are always bawling me out about little things..... No
143. No ? I kick my bed covers around something terrible..... Yes
144. No ? I "feel" people following me when I walk alone at night..... Yes
145. Yes ? People look strangely at me..... No

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146.	<u>Yes</u> ?	I would rather die than be where I am.....	<u>No</u>
147.	<u>Yes</u> ?	Are you permitted to have pets?.....	<u>No</u>
148.	<u>No</u> ?	My dad takes me places.....	<u>Yes</u>
149.	<u>Yes</u> ?	I have been told a lot of bad things by other people.....	<u>No</u>
150.	<u>Yes</u> ?	I am afraid of some of my relations.....	<u>No</u>
151.	<u>No</u> ?	Does your father worry about money?.....	<u>Yes</u>
152.	<u>Yes</u> ?	I would like to get married right away.....	<u>No</u>
153.	<u>No</u> ?	Older people are always laughing at me.....	<u>Yes</u>
154.	<u>No</u> ?	Is anyone at home willing to help you with your school work?.....	<u>Yes</u>
155.	<u>No</u> ?	Do you have to be quiet when your father is at home?.....	<u>Yes</u>
156.	<u>No</u> ?	Do you think your father should be more generous with his money.....	<u>Yes</u>
157.	<u>No</u> ?	My mother and father have answered truthfully all of my questions if they knew the answer.....	<u>Yes</u>
158.	<u>No</u> ?	It is fun to fool people.....	<u>Yes</u>
159.	<u>No</u> ?	Do you ever worry about jails?.....	<u>Yes</u>
160.	<u>No</u> ?	Do you ever worry about the world coming to an end?.....	<u>Yes</u>
161.	<u>No</u> ?	It seems hard to stand up straight.....	<u>Yes</u>
162.	<u>No</u> ?	My father and mother like one another.....	<u>Yes</u>
163.	<u>Yes</u> ?	I don't know any decent boys or girls.....	<u>No</u>
164.	<u>Yes</u> ?	I feel terribly strange when I give an oral theme.....	<u>No</u>
165.	<u>No</u> ?	It is easy to get by parents now.....	<u>Yes</u>
166.	<u>No</u> ?	Do you like to talk to your school teacher.....	<u>Yes</u>
167.	<u>No</u> ?	Do you fear being up high and looking down?.....	<u>Yes</u>
168.	<u>Yes</u> ?	Are you afraid when you are blindfolded?.....	<u>No</u>
169.	<u>Yes</u> ?	I have done wrong to make other people like me.....	<u>No</u>
170.	<u>Yes</u> ?	People have told me "scary" things.....	<u>No</u>
171.	<u>No</u> ?	It is terribly hard to "go straight".....	<u>Yes</u>
172.	<u>Yes</u> ?	Do you fear meeting hold up men?.....	<u>No</u>
173.	<u>No</u> ?	Are policemen watching their chance to get something on a boy or girl?...	<u>Yes</u>
174.	<u>Yes</u> ?	Did you ever have the habit of stuttering?.....	<u>No</u>
175.	<u>Yes</u> ?	Do you think you are more nervous than most boys and girls?.....	<u>No</u>
176.	<u>Yes</u> ?	Do you get started laughing and are unable to stop?.....	<u>No</u>
177.	<u>Yes</u> ?	Have you ever had a vision?.....	<u>No</u>
178.	<u>Yes</u> ?	Do you get all nervous when you see an accident?.....	<u>No</u>
179.	<u>No</u> ?	Do you worry about going to hell?.....	<u>Yes</u>
180.	<u>No</u> ?	Do you ever feel left out of things?.....	<u>Yes</u>
181.	<u>Yes</u> ?	Do you enjoy most of the things that your friends enjoy?.....	<u>No</u>
182.	<u>Yes</u> ?	Do you have to watch most people or they will cheat you?.....	<u>No</u>
183.	<u>Yes</u> ?	Do you mind having your friends see you working?.....	<u>No</u>
184.	<u>Yes</u> ?	Is there anything you do better than anyone else?.....	<u>No</u>
185.	<u>Yes</u> ?	Do you ever have any luck selling anything?.....	<u>No</u>
186.	<u>No</u> ?	Do you think you will accomplish as much as your parents have?.....	<u>Yes</u>
187.	<u>No</u> ?	All fathers are good for is to earn money.....	<u>Yes</u>
188.	<u>Yes</u> ?	It is easy for me to get by in school.....	<u>No</u>

189. Yes ? I believe that most people are real good..... No  
 190. No ? If I work very hard my back bothers me..... Yes  
 191. No ? I used to be afraid of my father..... Yes  
 192. No ? Kids have made fun of me..... Yes  
 193. No ? Do you sometimes like to pretend that you are somebody else?..... Yes  
 194. No ? Does saying your prayers at night make you feel better?..... Yes  
 195. No ? Do you make up stories about yourself helping other people out of trouble? Yes  
 196. Yes ? Do you ever day dream about being adopted by a rich family?..... No  
 197. Yes ? Mothers know more than fathers..... No  
 198. No ? Do you break and tear and spoil things more than most boys (girls) do?.. Yes  
 199. No ? Does your heart ever pound in your ears?..... Yes  
 200. Yes ? Do you ever feel as if you were smothering?..... No  
 201. Yes ? Can you find your way about in the dark with very little trouble?..... No

The maladjusted answers are underlined.

#### REFERENCE

- (1) THURSTONE, L. L. AND T. G.: A neurotic inventory. J. of Soc. Psychol., 1930, 1, 3-30.

## Brief Reports

### A Note on the Relative Development-Age Scores of Urban and Rural Boys

A RECENT study by Merwick (1) investigated the influence on Developmental Age of five social factors, namely, socio-economic status, residence in a child-caring institution, urban life, residence in a particular part of the country, and position in the family. Of the five, urban life stood out most prominently. The present paper represents an attempt to analyze more fully this factor of urban, as against rural, environment, to determine what tests in the scale account for the higher average scores of urban boys and to suggest, if possible, the reasons underlying these higher scores.

The subjects were 187 boys, aged eleven to thirteen years. All were from the same section of the country, namely, the West North Central area. All were white children living in their own homes. The factor of age was controlled by instituting comparisons separately at the eleven, twelve, and thirteen-year age levels. Socio-economic status, mental age, position in the family, and number of siblings were not controlled, since previous studies have failed to show that these factors are significantly related to Developmental Age.

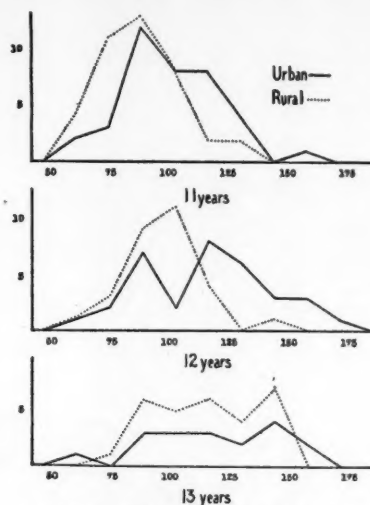
The accompanying figure 1 shows that the precocity of the urban boys exists at all three ages, although it is

less striking in the case of the 13-year-olds. It is interesting to ask whether this superiority is present in all the six tests of the scale or is confined to some of them. Table 1 compares the mean scores on the six tests at the three ages. As will be seen, the rural boys are ahead in only two of the eighteen comparisons. The conventional procedure at this point would be to compare the obtained differences to their standard errors; but to the present writer this seems a pointless procedure when we do not know that the variable in question is normally distributed.

Table 2 shows essentially the same comparison, but in slightly different form. Here the percentages of urban boys exceeding the median score of the rural group are tabled. As will be seen, the percentages only twice drop below fifty per cent and are equal to that figure in one other case.

An examination of these tables shows that the urban precocity is not confined to any one of the six tests, but is fairly evenly distributed over five of them. Test 6, which deals with "things to think about," is the only test which fails to show the characteristic urban precocity. The writer can suggest no reason why Test 6 should differ in this respect from the other tests. Probably it is to be

explained as a sampling phenomenon. in the present paper afford an objective confirmation of this popular belief; It has often been said that city boys



Distribution of Total DA Score of Urban and Rural Boys at Specified Ages

FIG. 1

TABLE 1

*Comparison of means of rural and urban groups on the separate tests*

GROUP	TESTS						Total
	1	2	3	4	5	6	
11-year urban.....	26.3	12.0	12.2	21.5	13.8	14.2	100.0
11-year rural.....	21.0	10.1	10.0	18.9	13.2	13.6	86.8
Difference*.....	5.3	1.9	2.2	2.6	0.6	0.6	13.2
12-year urban.....	30.6	14.5	14.3	26.1	15.5	16.1	117.1
12-year rural.....	25.6	11.0	10.9	20.8	13.6	15.3	97.2
Difference.....	5.0	3.5	3.4	5.3	1.9	0.8	19.9
13-year urban.....	31.0	13.5	15.2	26.0	15.7	17.0	118.4
13-year rural.....	32.0	11.3	14.0	23.3	15.5	18.0	114.1
Difference.....	-1.0	2.2	1.2	2.7	0.2	-1.0	4.3

\* Urban minus rural.

act more maturely than country boys for they show a precocity equivalent of the same age.<sup>1</sup> The data reported to about a year and one-third at age

eleven, about two years at twelve, and about one-third of a year at thirteen.

TABLE 2  
*Percentage of urban boys exceeding median  
D. A. of rural boys*

AGE	TESTS						Total
	1	2	3	4	5	6	
11	63	68	68	55	58	58	77
12	73	70	70	73	73	61	70
13	44	67	61	56	50	39	56

Possibly these differences are large enough to be taken into account by those who plan practical work with

boys. If this is true, then we should not try to fit urban and rural boys into the same mould. Recreational programs should not be taken over bodily from the city and applied to country boys without making due allowance for urban precocity. Books written for parents should take account of these rural-urban differences. Our present knowledge of the child is based on data gathered within a rather restricted range of social conditions. Perhaps, in the future, we ought to become more conscious of the possible effects of differential environments.

PAUL HANLY FURFEY.

#### REFERENCE

- (1) MERWICK, JEROME: A study of developmental age and social factors. Washington, Catholic University of America, 1933, 45 p. (Typewritten M.A. dissertation.)

